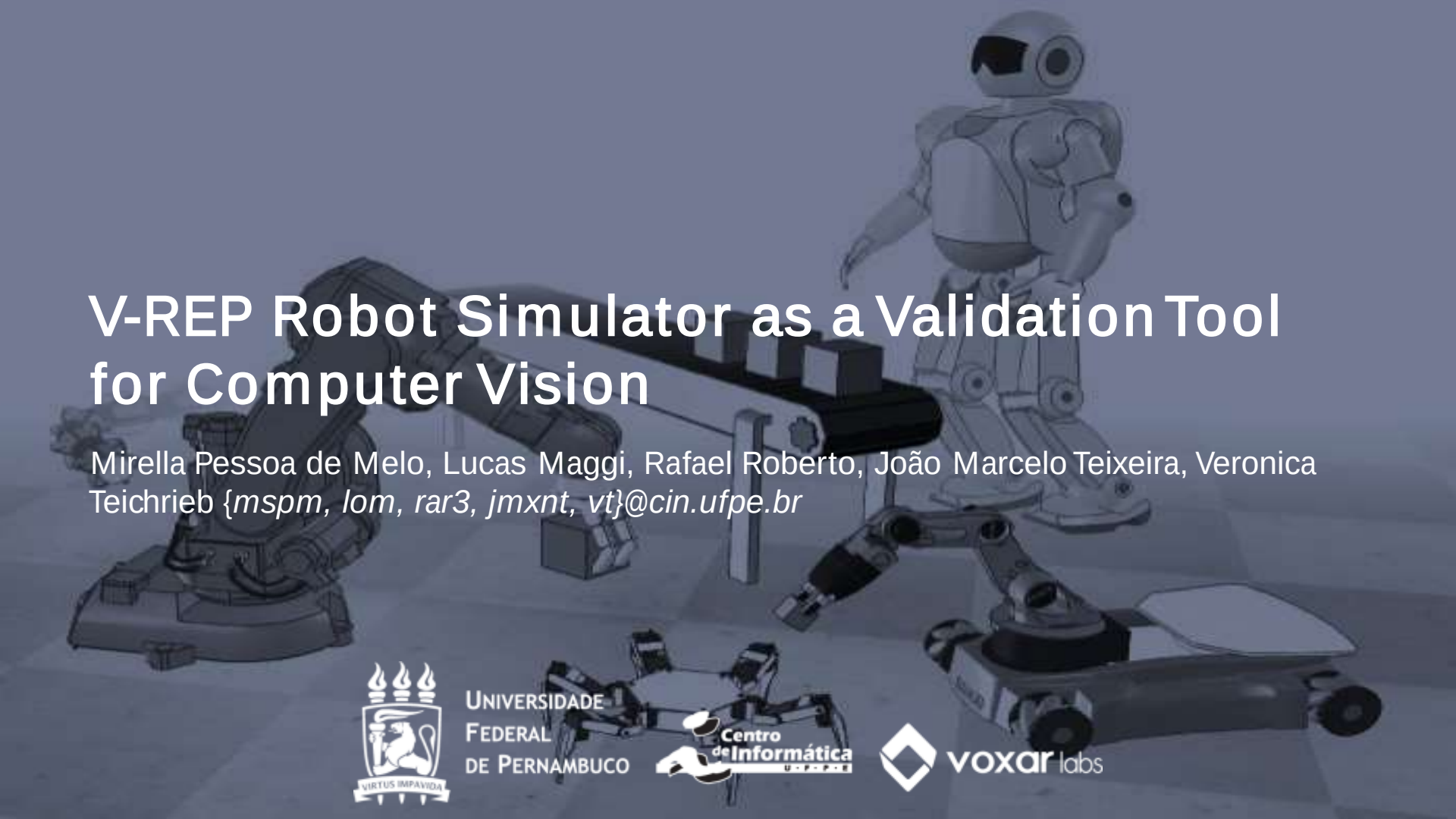


V-REP Robot Simulator as a Validation Tool for Computer Vision

Mirella Pessoa de Melo, Lucas Maggi, Rafael Roberto, João Marcelo Teixeira, Veronica Teichrieb {*mspm, lom, rar3, jmxnt, vt*}*@cin.ufpe.br*

Universidade Federal de Pernambuco

Centro de Informática

voxar labs

Summary

- Theoretical background
  - Computer vision
  - V-REP
- Practice
  - Creating scene in V-REP (elements)
  - Integrating V-REP and OpenCV with Visual Studio
  - Access the kinect image through API
  - Line follower robot
  - Controling Pionner Robot through keyboard

Computer vision: what's that?!

- "Just like to hear is not the same as to listen, to take pictures is not the same as to see and by seeing, we really mean understanding", Standford AI Lab's Dr. Fei-Fei Li.

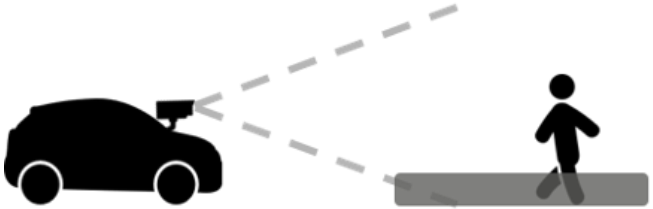
- Teach machine to visually understand the world like a human.

Computer vision:: applications

- Face recognition

Computer vision:: applications

- Self-driving cars

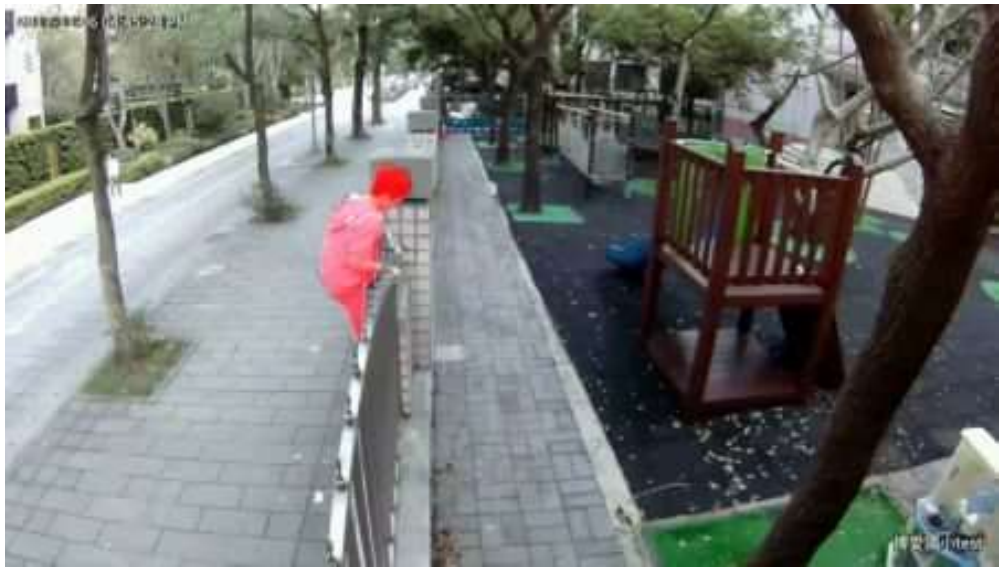


Computer vision:: applications

- Self-driving cars

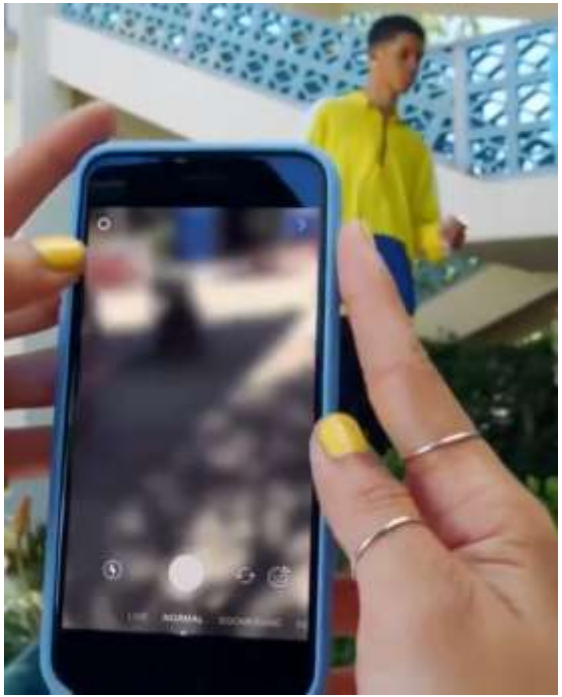
Computer vision:: applications

- Security



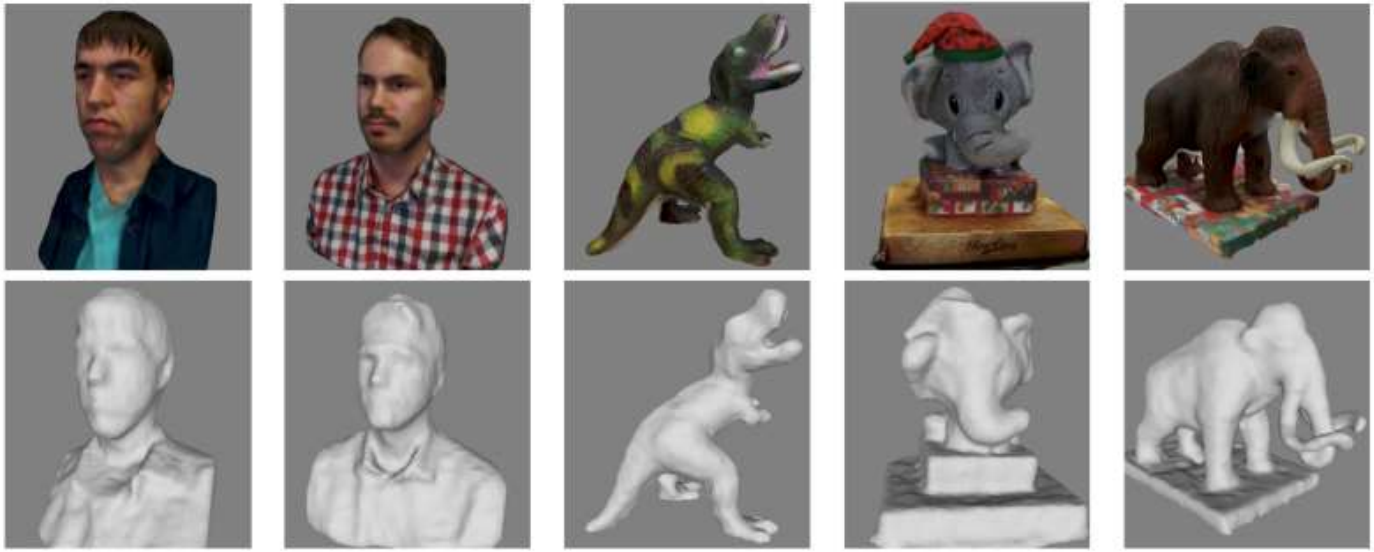
Contextualizing:: applications

- Tracking



Computer vision:: applications

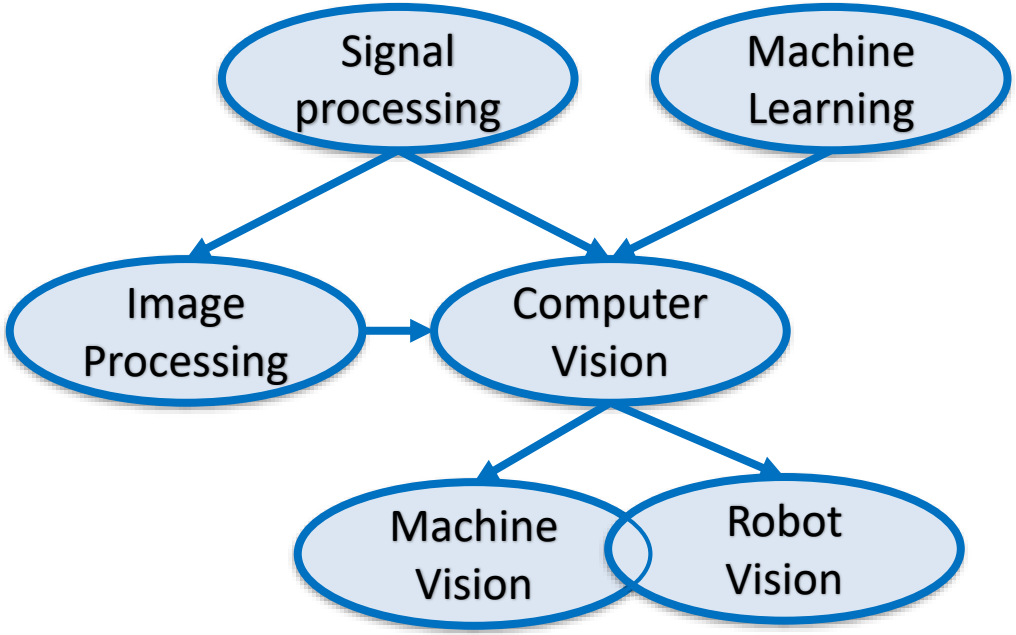
- 3D reconstruction



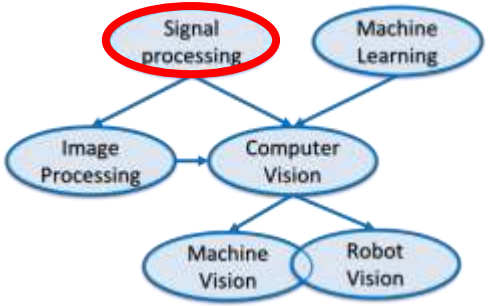
Computer vision:: applications

- 3D reconstruction

Contextualizing:: related areas

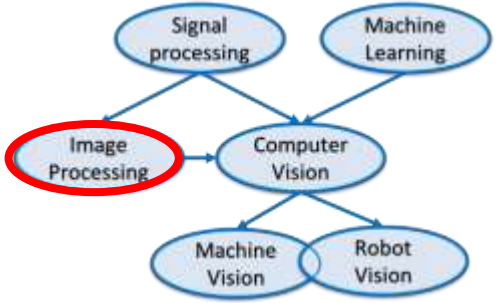


Contextualizing:: related areas:: signal processing



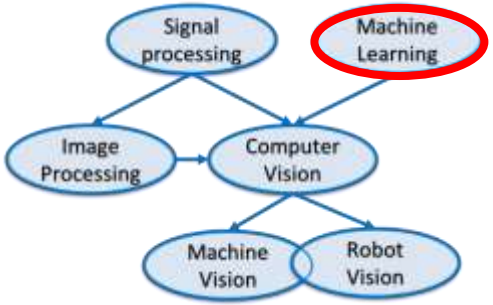
Input	Output
Electrical signals	Electrical signals

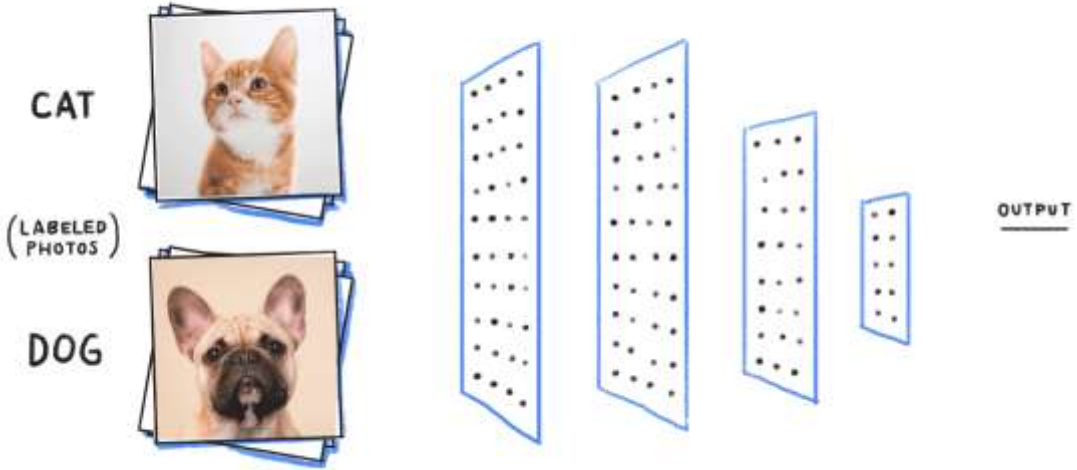
Contextualizing:: related areas:: image processing



Input	Output
Image	Image

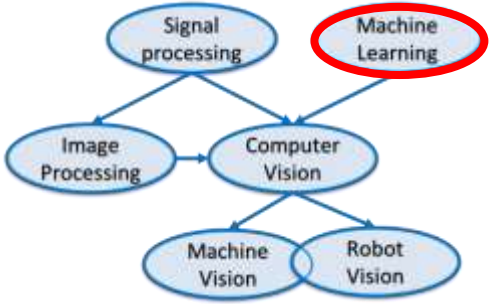
Contextualizing:: related areas:: machine learning in computer vision

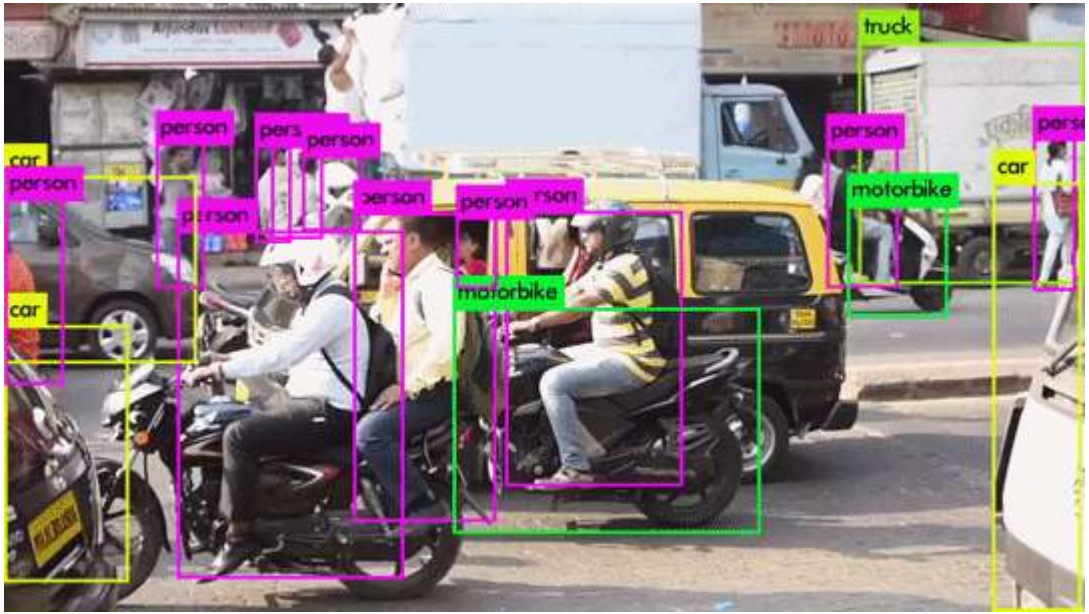




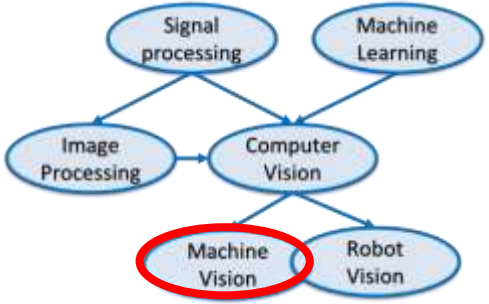
Input	Output
Images	Informations

Contextualizing:: related areas:: machine learning in computer vision





Contextualizing:: related areas:: machine vision

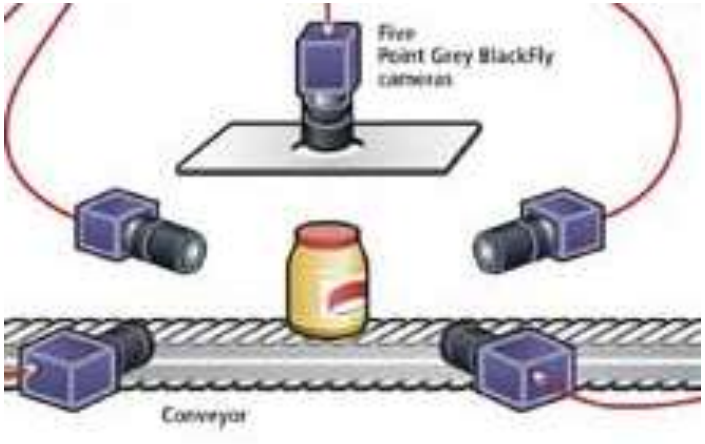


- Machine vision traditionally refers to the use of computer vision in an industrial or practical application or process;
- Computer vision applied in industry.

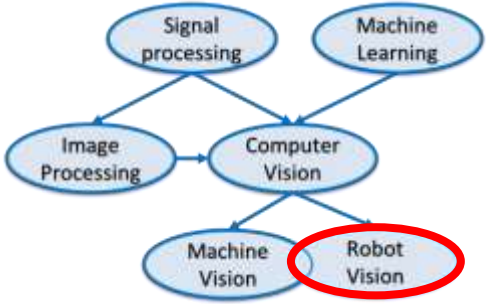
Input	Output
Image	Informations

Contextualizing:: related areas:: machine vision:: applications

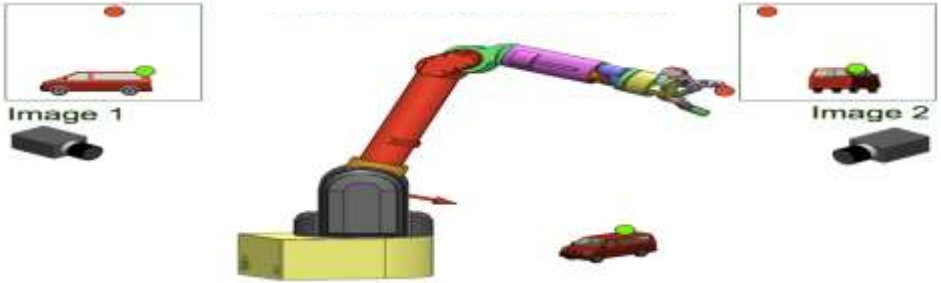
- Presence and absence of components
- Defects detection
- Parts identification, counting, dimensions measurement and positioning
- Quality of barcode grading print
- Color identification



Contextualizing:: related areas:: robot vision



- Robot Vision must incorporate aspects of robotics into Computer Vision techniques and algorithms, such as kinematics



Input	Output
Image	Physical actions

V-REP: what's that?!

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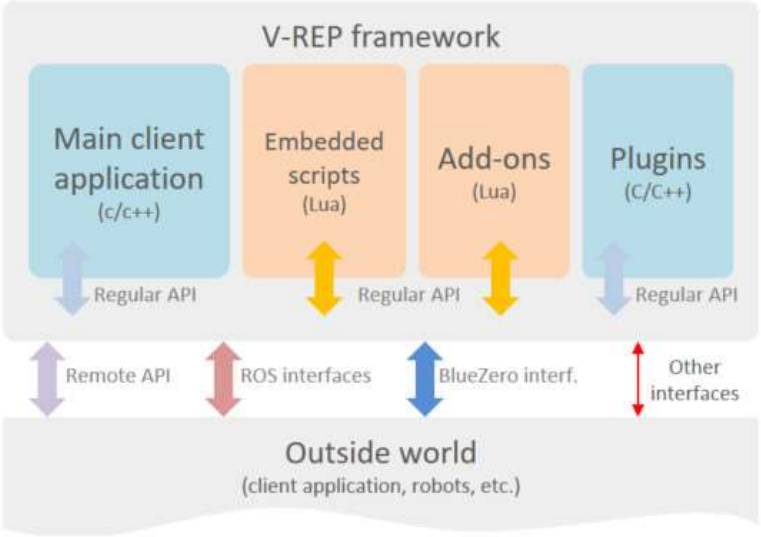
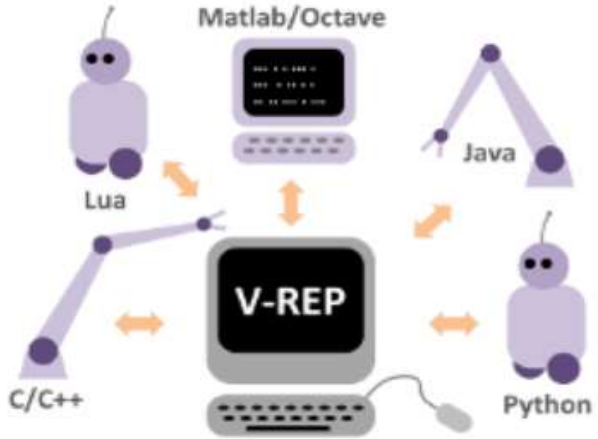
V-REP: what's that?!

- Each element can be individually controlled by an embedded script, a plugin, ROS nodes, BlueZero nodes or remote API clients.



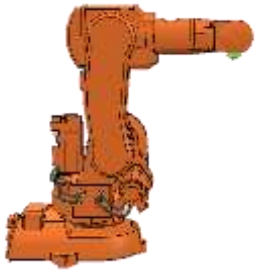
V-REP: what's that?!

- Controllers can be written in C/C++, Python, Java, Lua, Matlab or Octave.



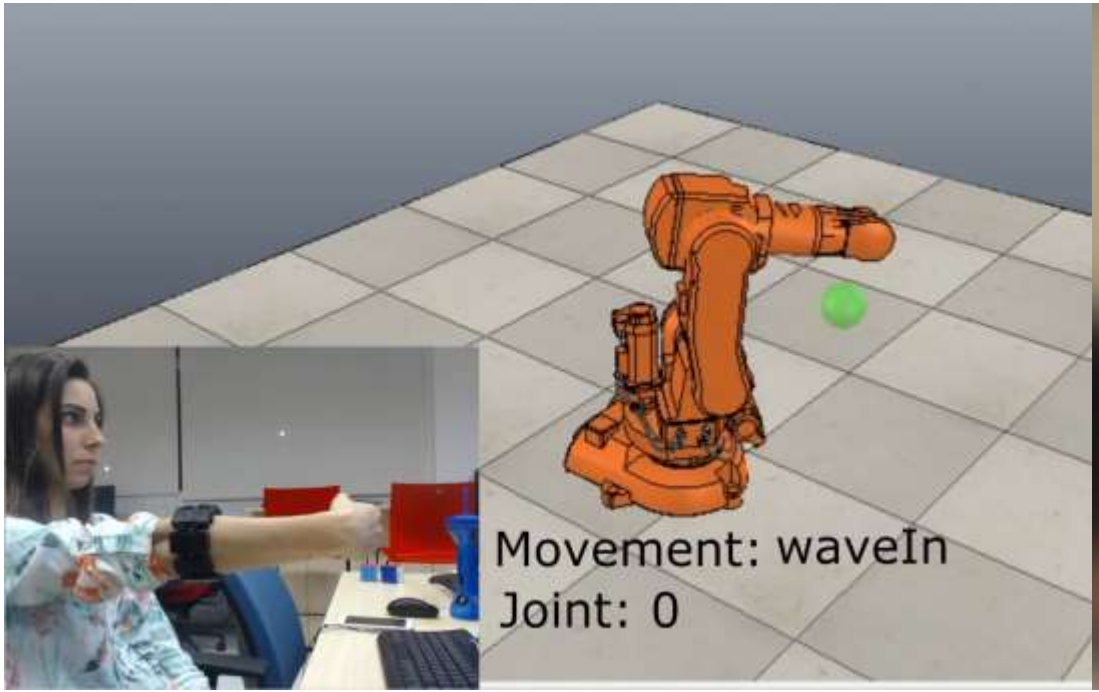
V-REP: it's a good idea?!

- Virtual simulators represent a simple and inexpensive alternative to create systems, platforms and prototypes;



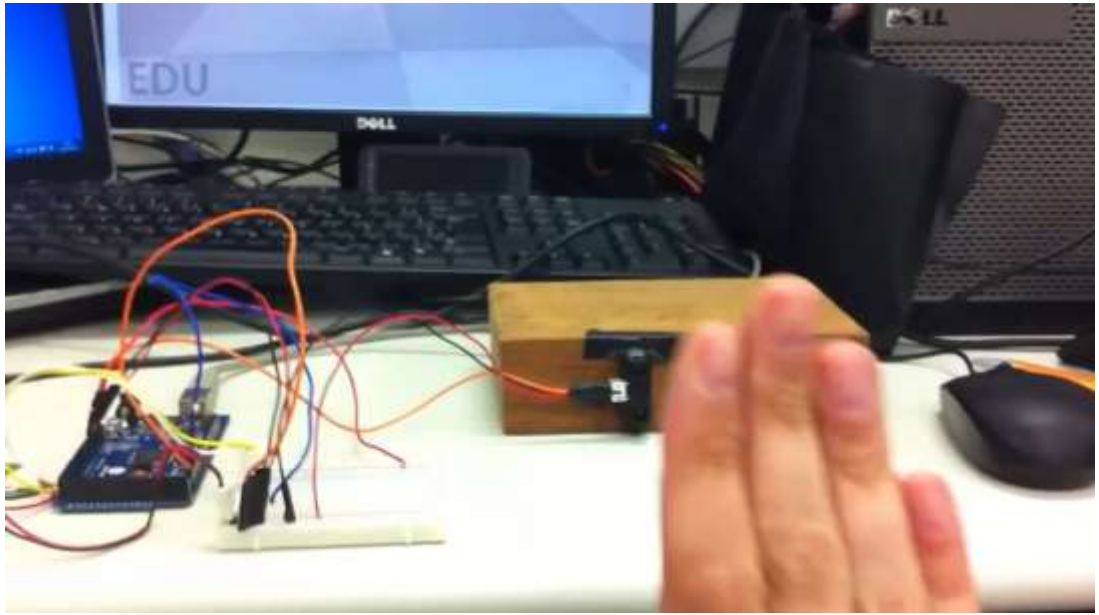
- Besides creating, it's possible to simulate and then, validate (or not) the idea;
- Avoid problems and possible mistakes during the real implementation (isolate variables).

V-REP:: applications



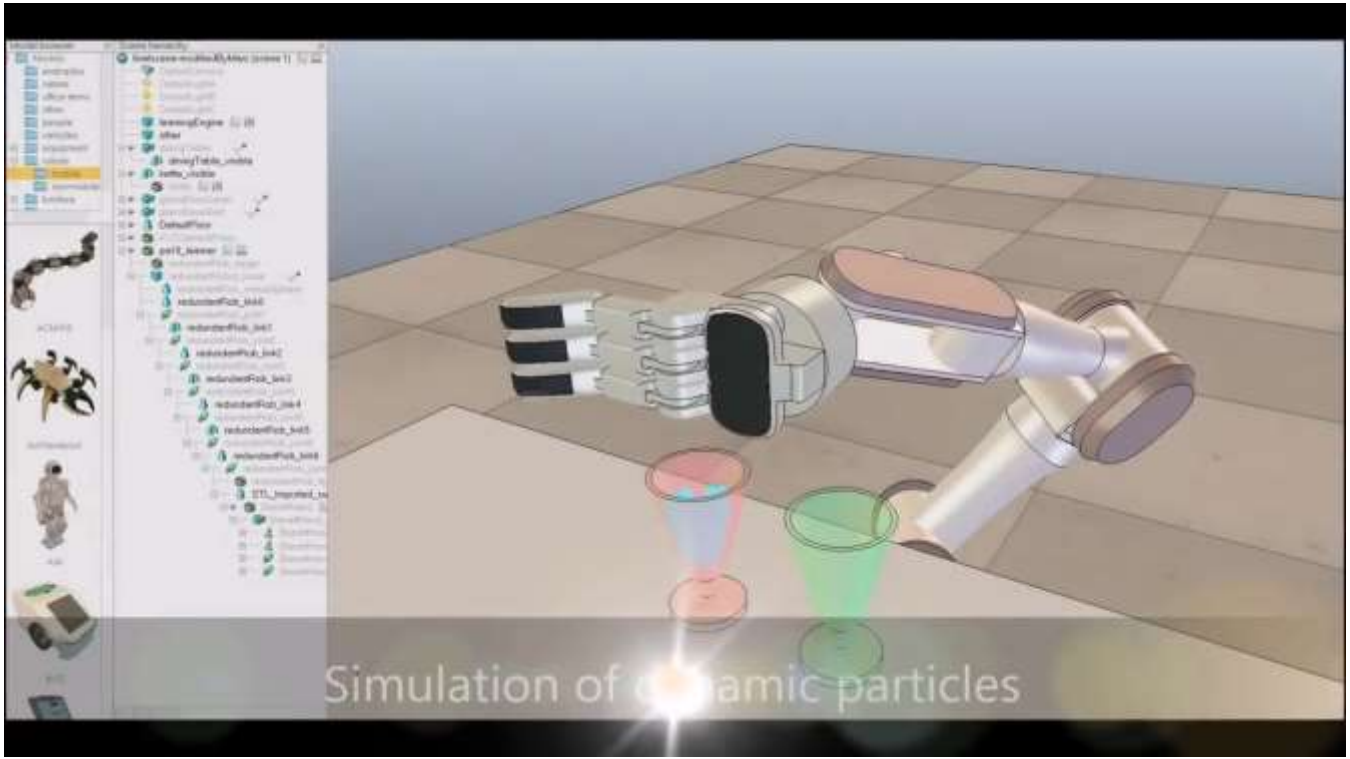
V-REP:: applications

V-REP:: applications

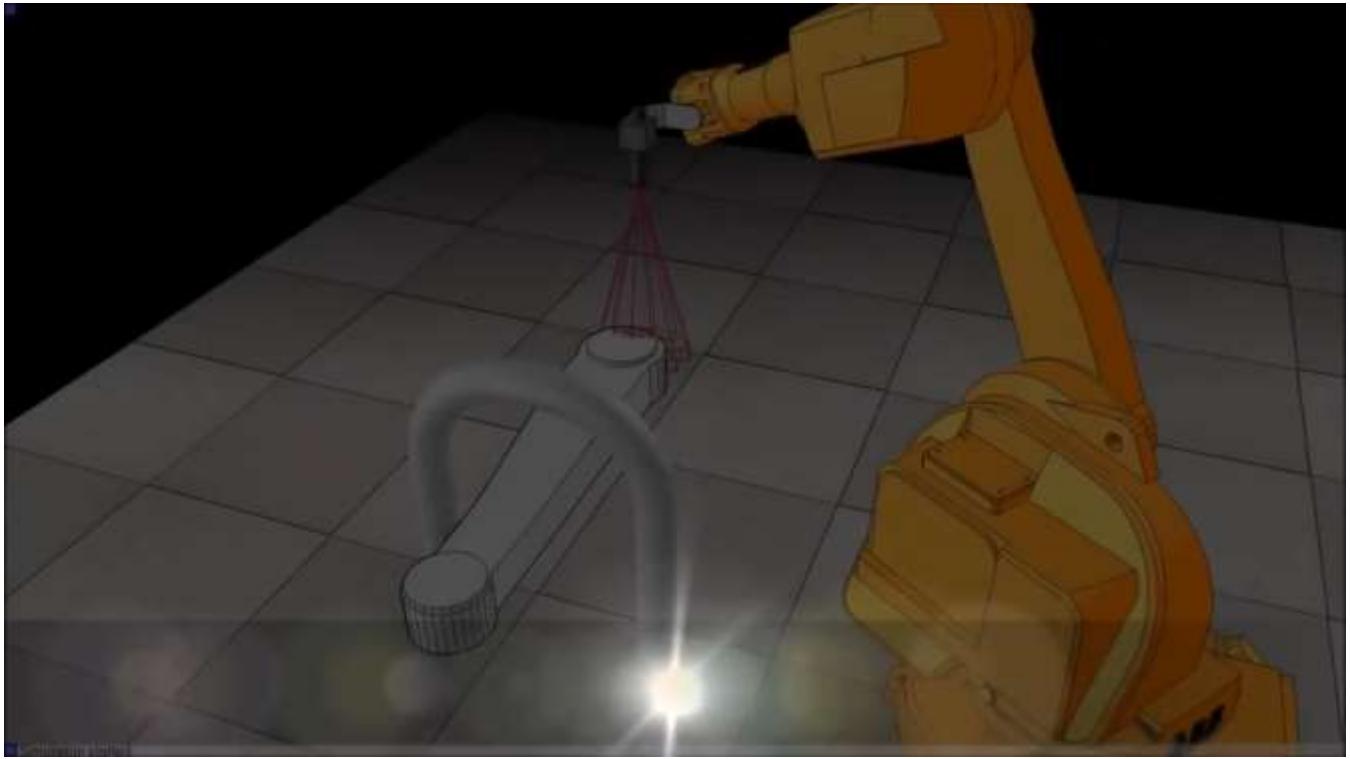


V-REP:: applications

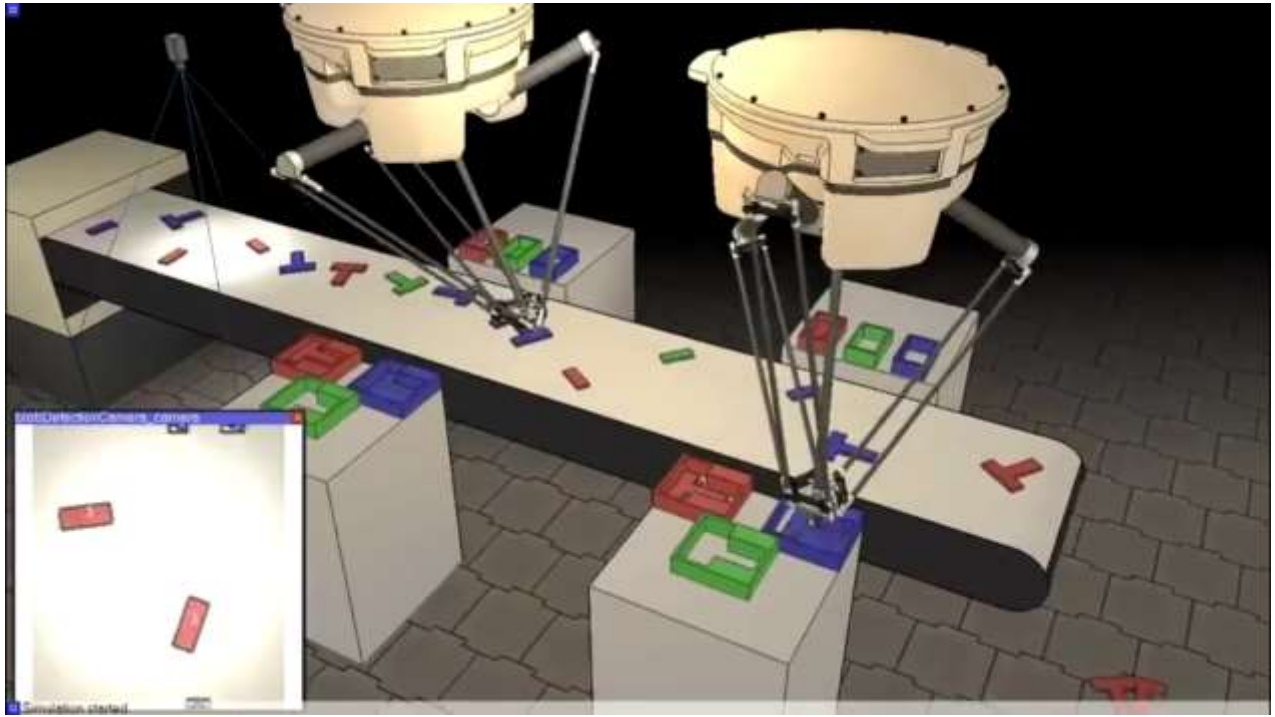
V-REP:: applications



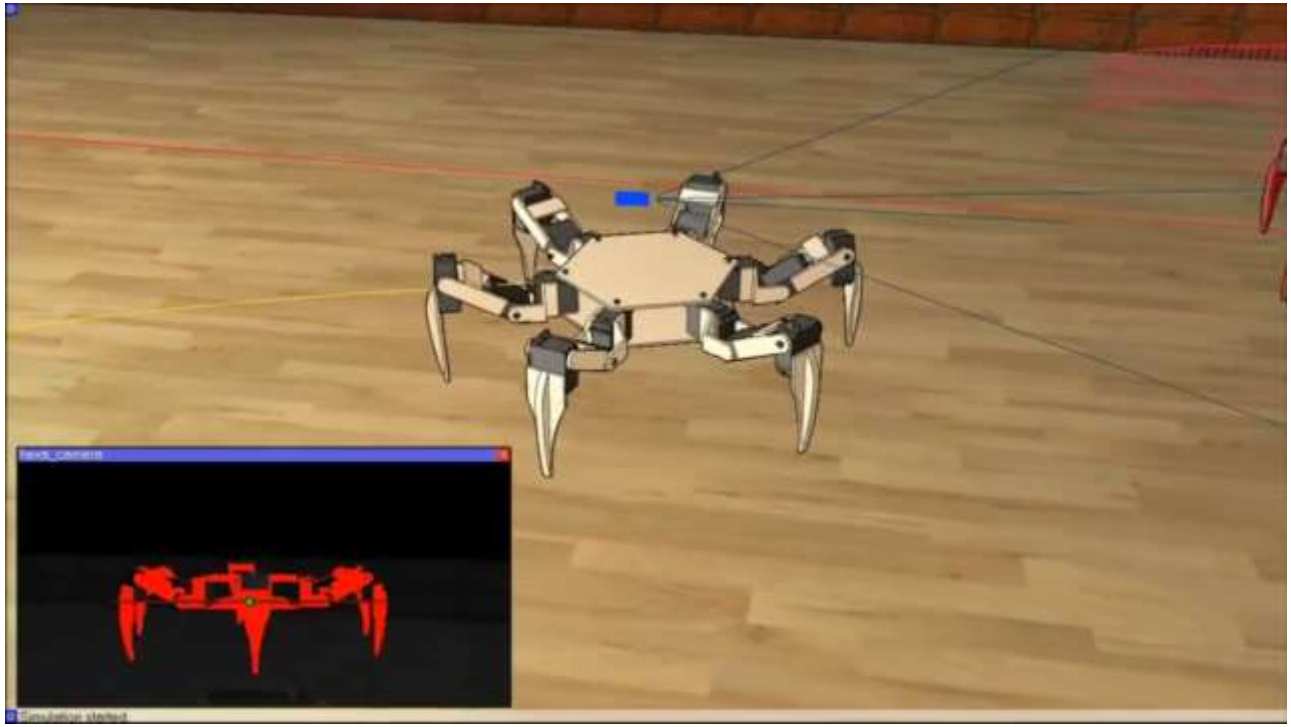
V-REP:: applications



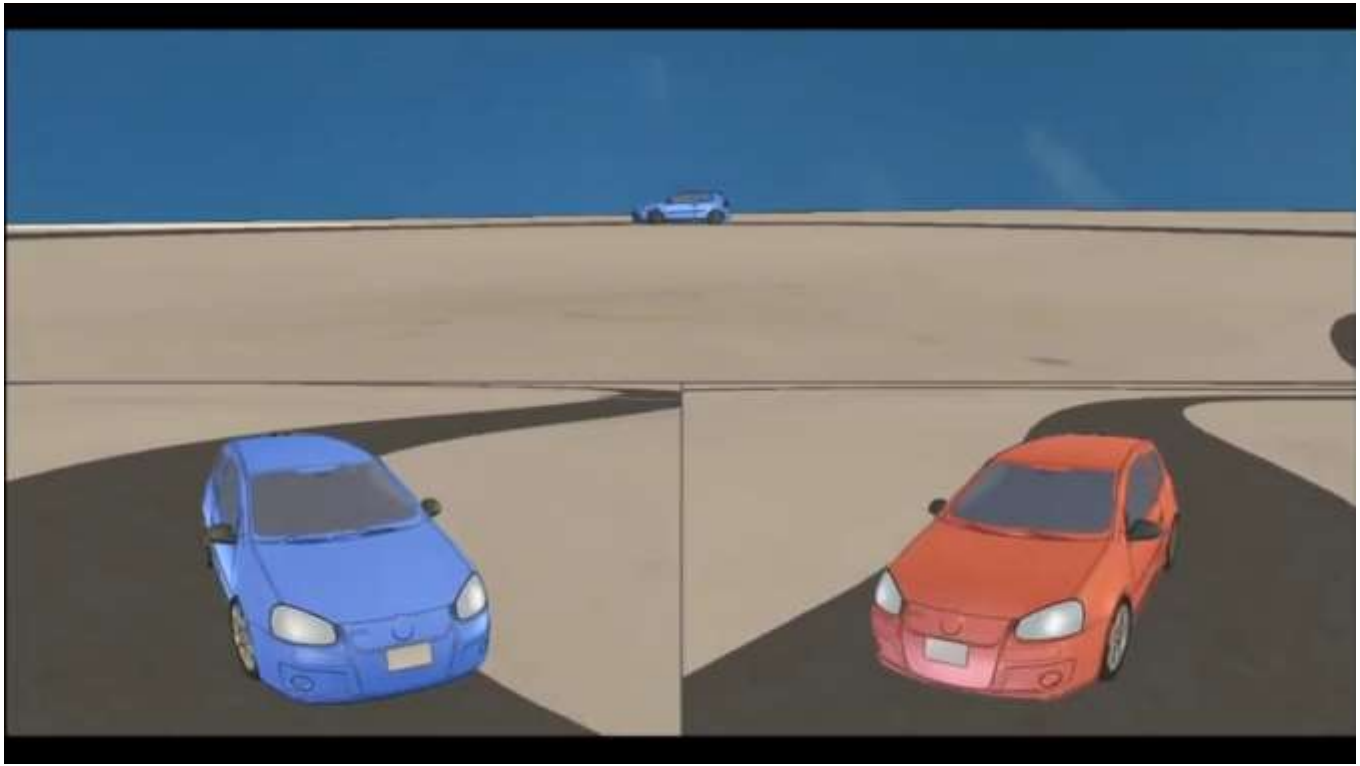
V-REP:: applications with computer vision



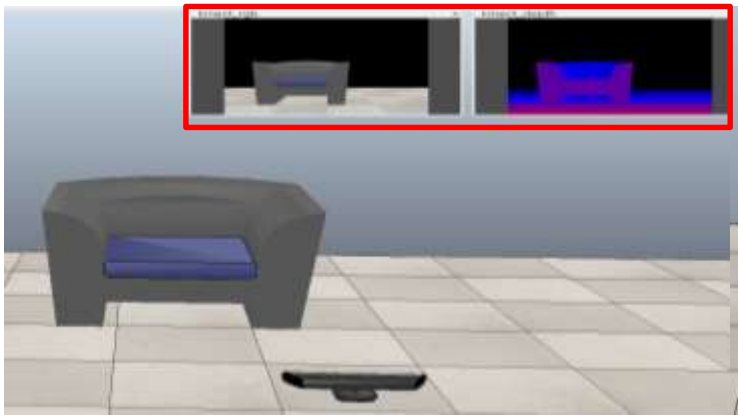
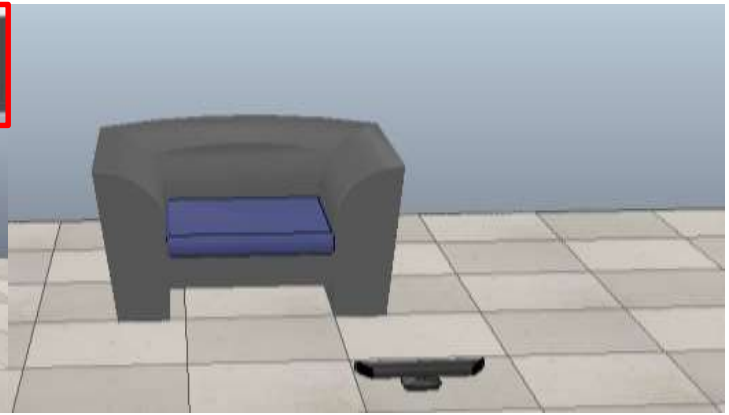
V-REP:: applications with computer vision



V-REP:: applications with (no) computer vision



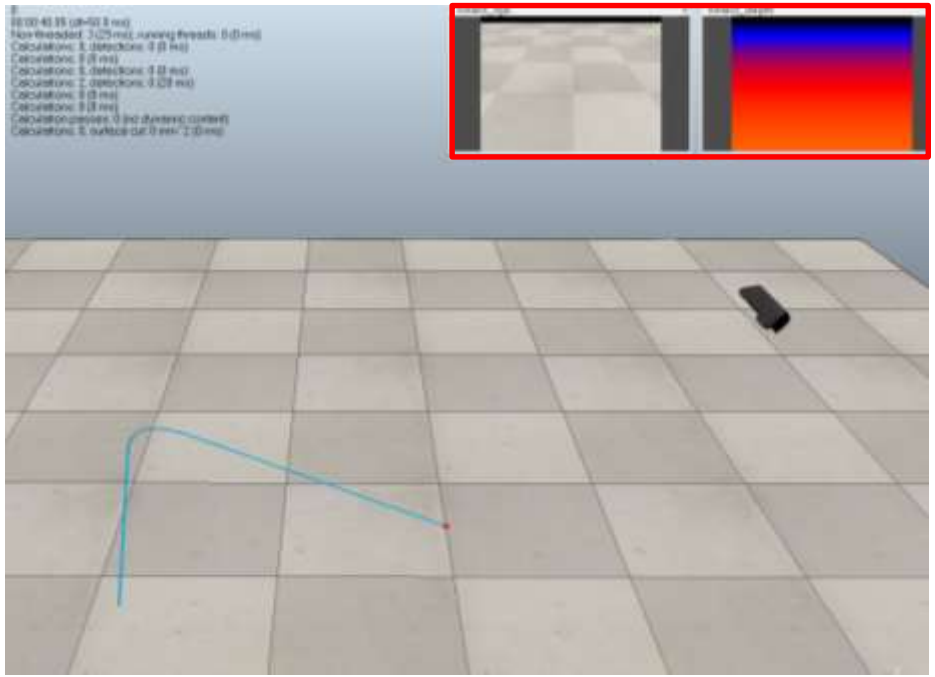
V-REP:: vision sensor and camera

Vision sensor	Camera
	

V-REP:: vision sensor and camera

Vision sensor	Camera
Fixed resolution	No specific resolution (adjust automatically)
Can be accessed via API	Not directly available via the API, but via a callback mechanism
Processing filters are available	Image processing not directly supported
Can only display renderable objects	A camera can display all object types

V-REP:: vision sensor and camera



V-REP:: vision sensor:: renderable objects


Shapes

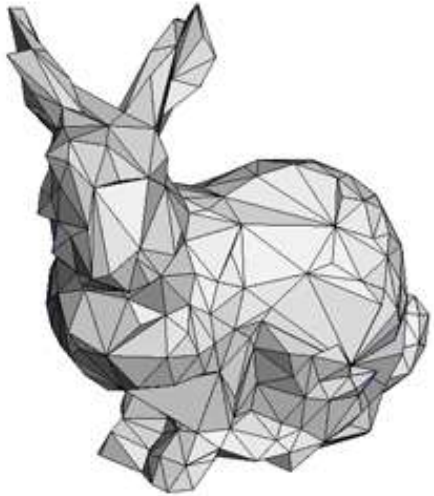

Paths


Mirrors


Octrees

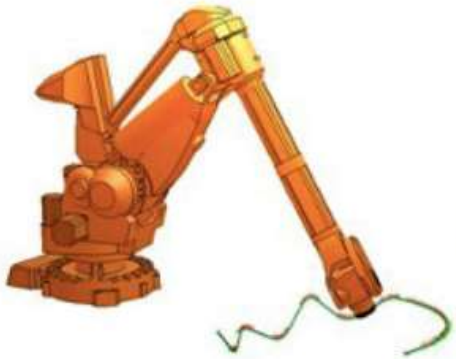
V-REP:: vision sensor:: renderable objects

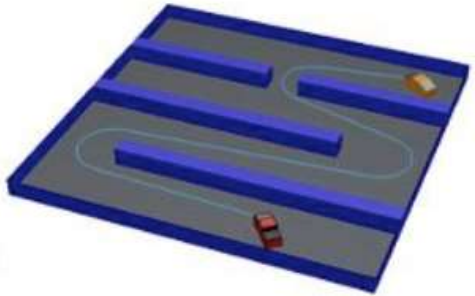
- Shapes: rigid mesh objects composed of triangular faces.
- Paths
- Mirrors
- Octrees



V-REP:: vision sensor:: renderable objects

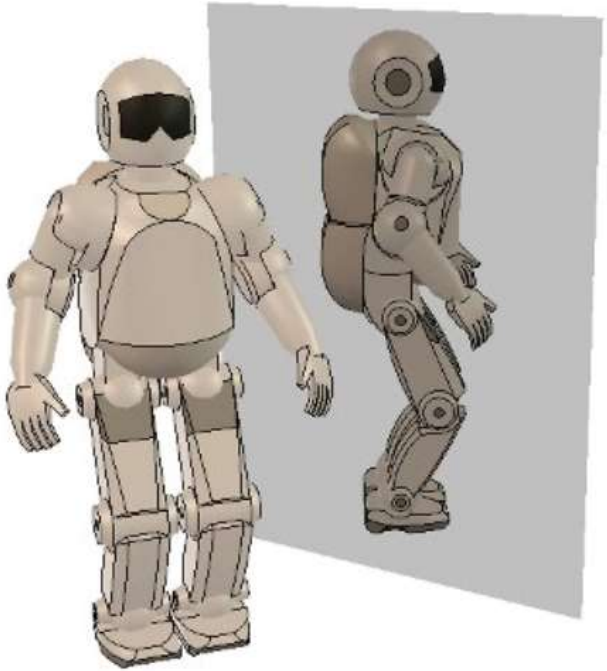
- Shapes
- Paths: an object that defines a path or trajectory in space.
- Mirrors
- Octrees





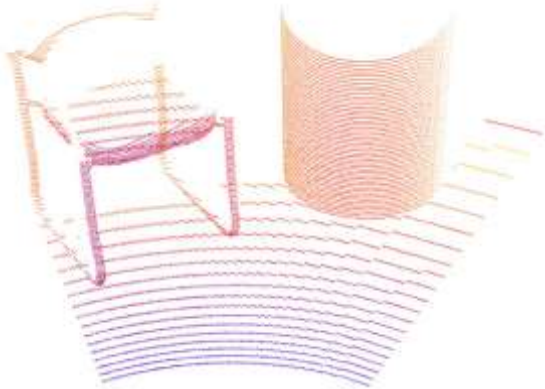
V-REP:: vision sensor:: renderable objects

- Shapes
- Paths
- Mirrors
- Octrees



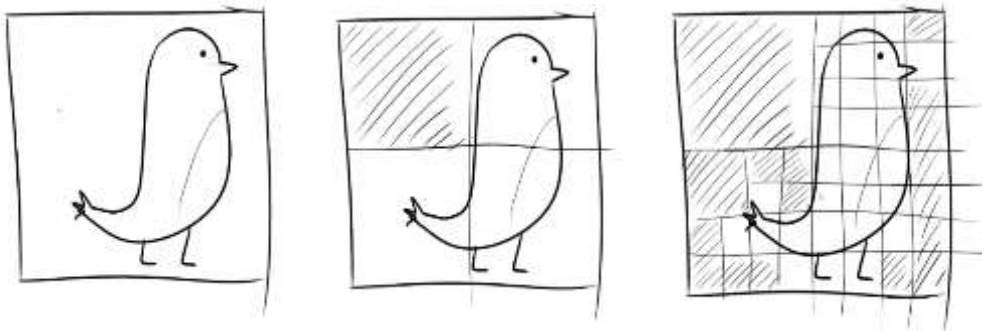
V-REP:: vision sensor:: renderable objects

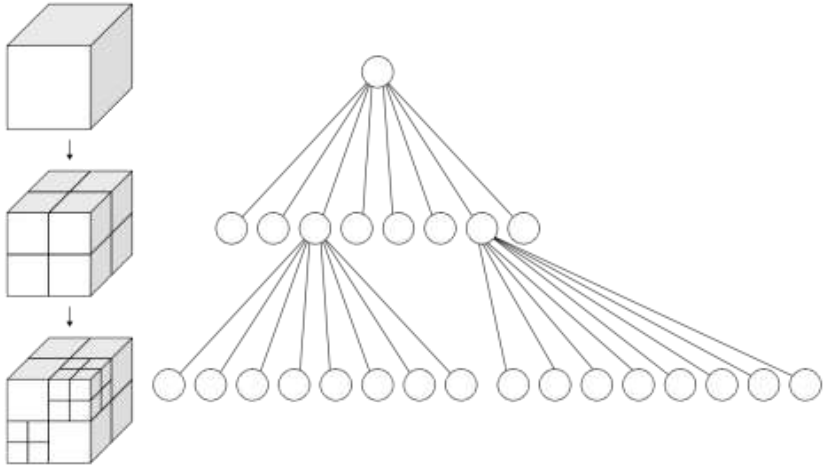
- Shapes
- Paths
- Mirrors
- Octrees
  - voxels
  - points cloud



V-REP:: vision sensor:: renderable objects

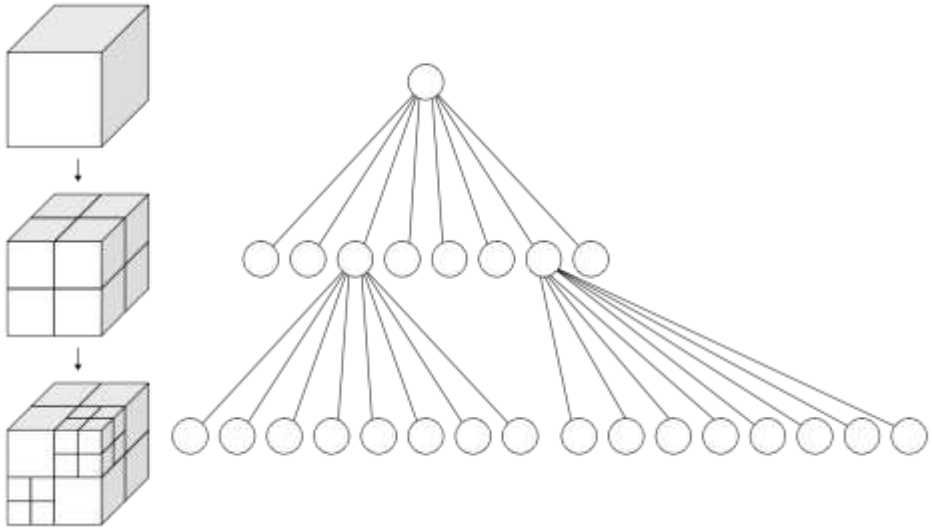
Octrees





V-REP:: vision sensor:: renderable objects

Octrees



V-REP:: vision sensor:: renderable objects

Octrees made by voxels

- Collidable
- Measurable
- Detectable objects

V-REP:: vision sensor:: renderable objects

Octrees made by points

- Collidable
- Measurable
- Detectable objects

V-REP:: vision sensor:: graphs

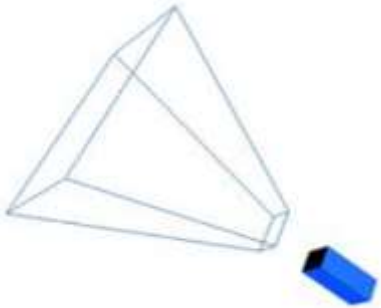
OBS: data streams recorded by a graph can be exported to a *.csv file.

Data related to vision sensors:

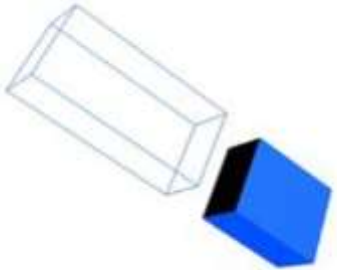
- Minimum red/green/blue/intensity/depth value
- Maximum red/green/blue/intensity/depth value
- Average red/green/blue/intensity/depth value
- Detection state (detect or not something)

V-REP:: vision sensor:: types

- Perspective projection

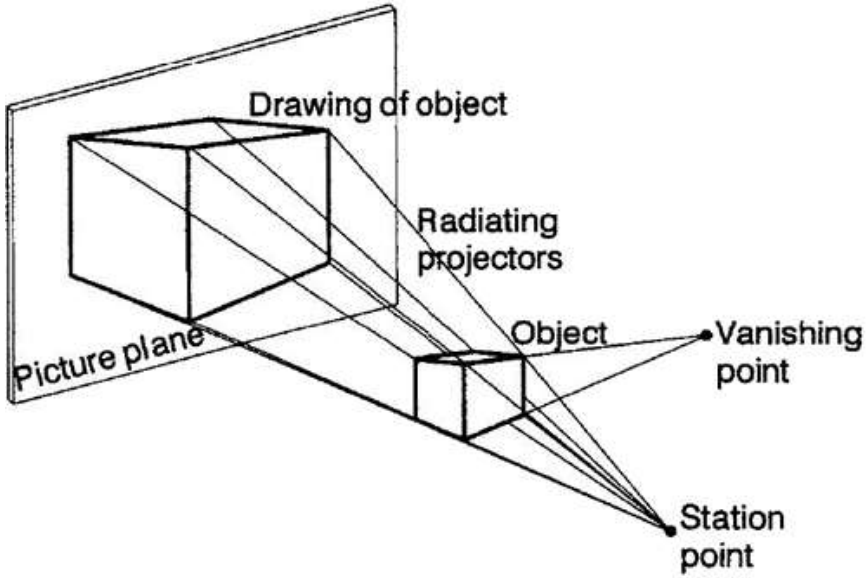


- Ortographic projection

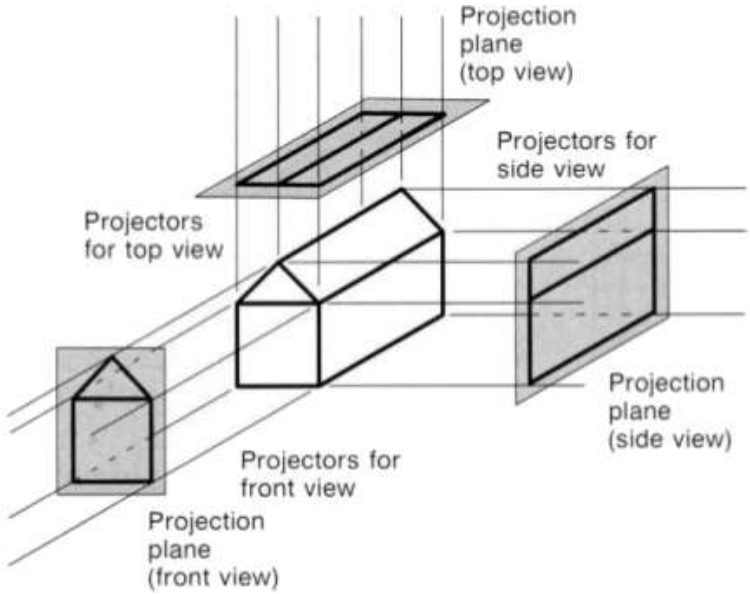


V-REP:: vision sensor:: types

- Perspective projection

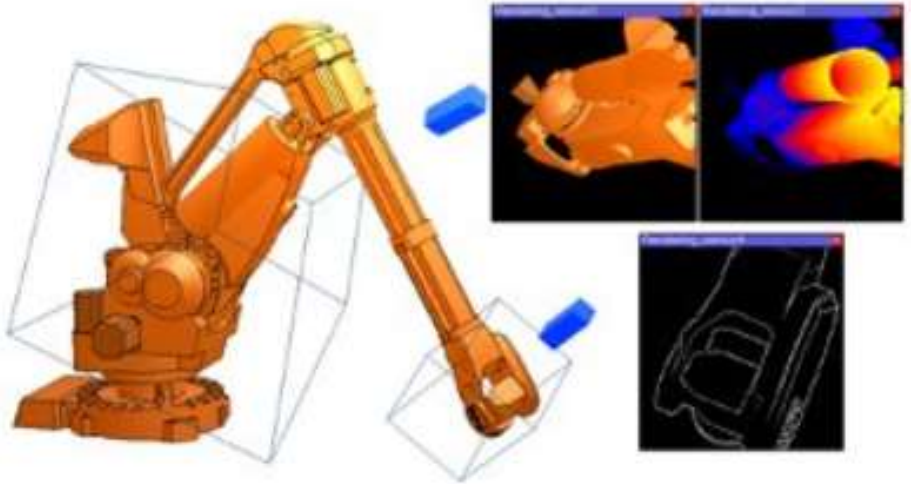


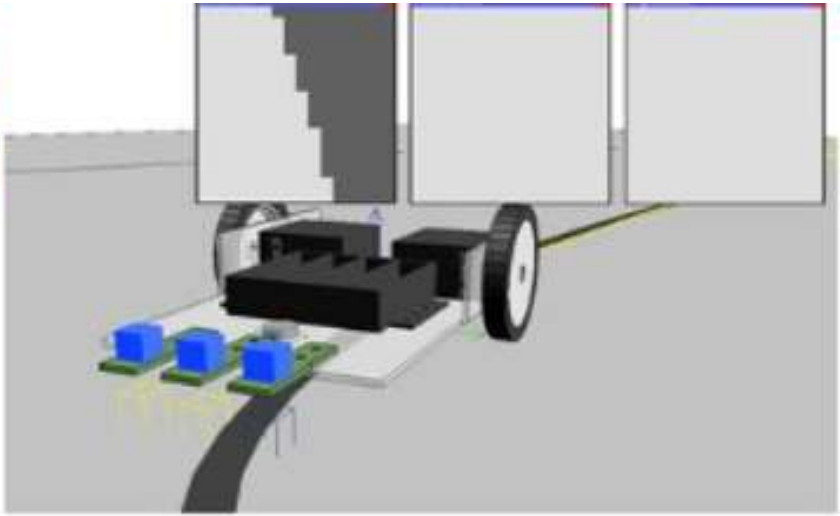
- Orthographic projection



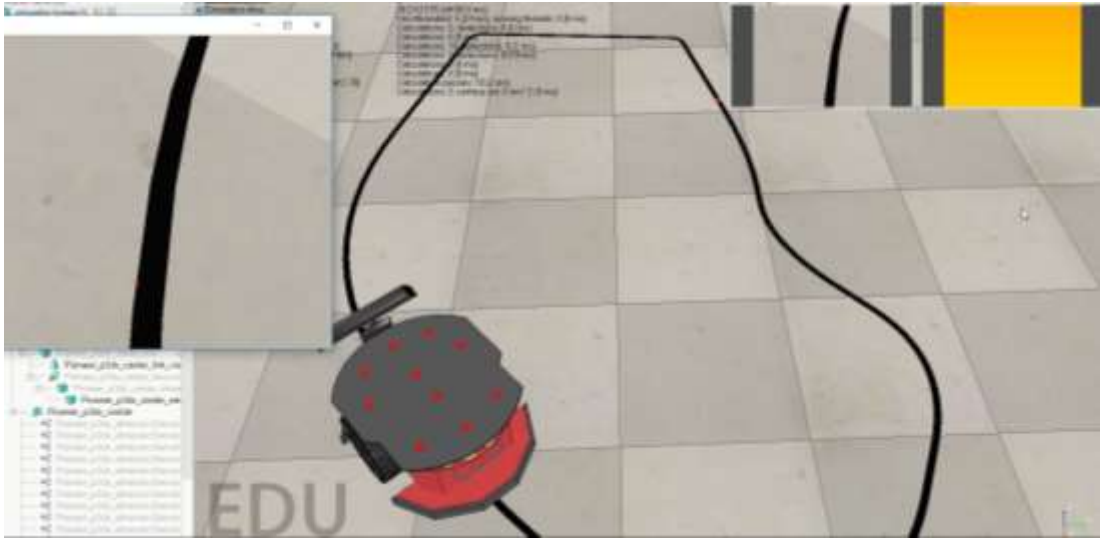
V-REP:: vision sensor:: types

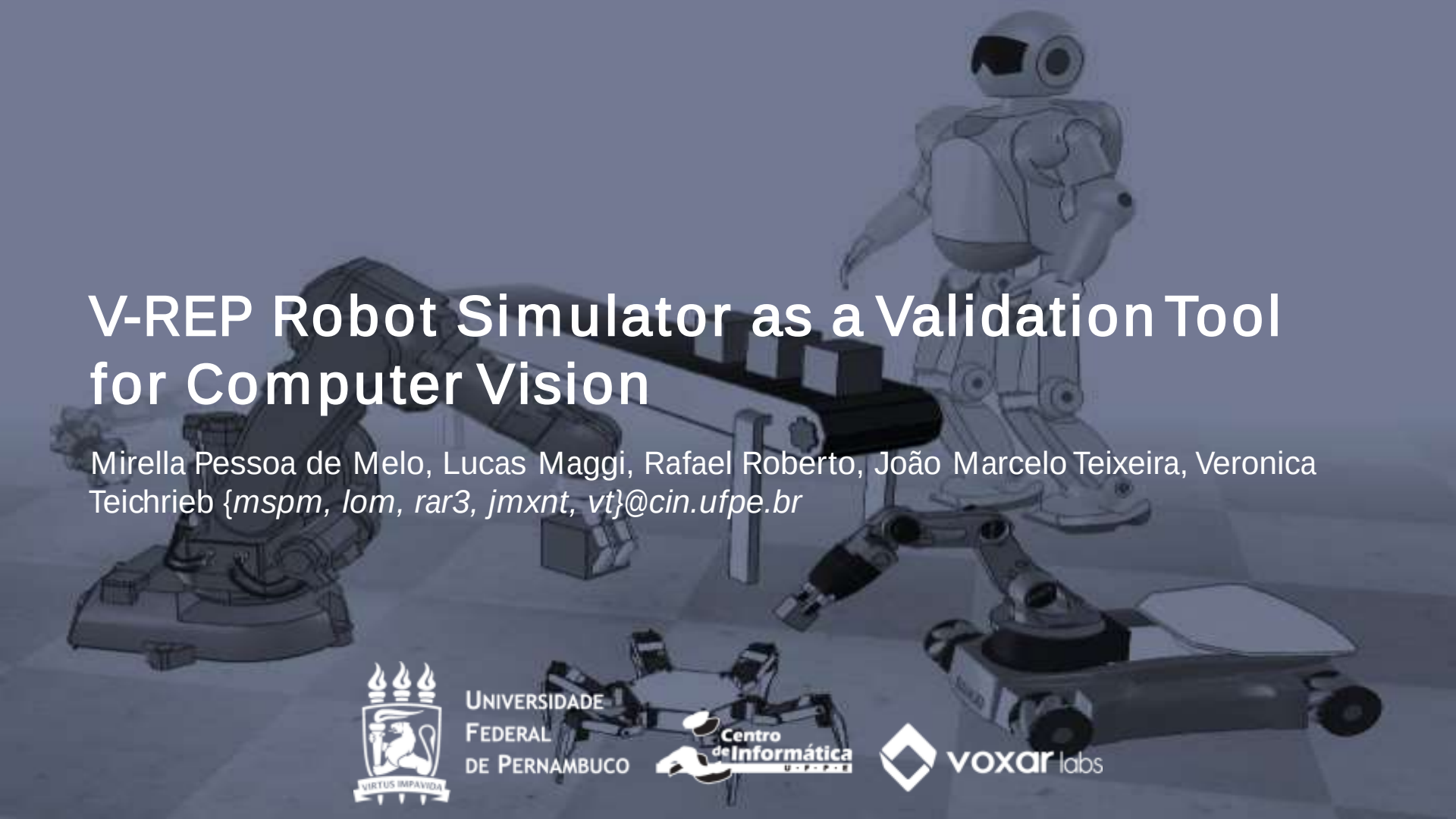
- Perspective projection
- Ortographic projection





MORE ABOUT V-REP DURING PRATICAL PART!!!





V-REP Robot Simulator as a Validation Tool for Computer Vision

Mirella Pessoa de Melo, Lucas Maggi, Rafael Roberto, João Marcelo Teixeira, Veronica Teichrieb {*mspm, lom, rar3, jmxnt, vt*}*@cin.ufpe.br*

Universidade Federal de Pernambuco

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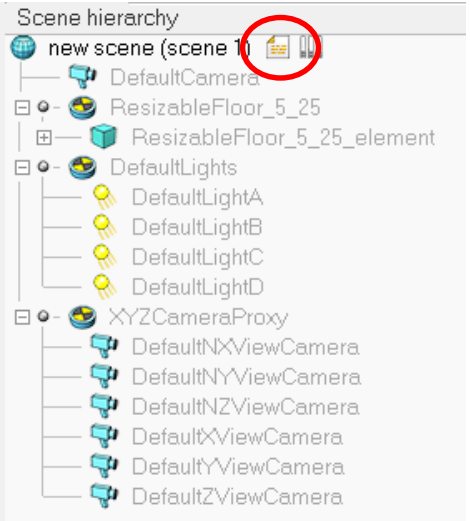
Summary

- Theoretical background
  - Computer vision
  - V-REP
- Practice
  - Creating scene in V-REP
  - Integrating V-REP and OpenCV with Visual Studio
  - Access the kinect image through API
  - Line follower robot
  - Controling Pionner Robot through keyboard

Before going to V-REP...

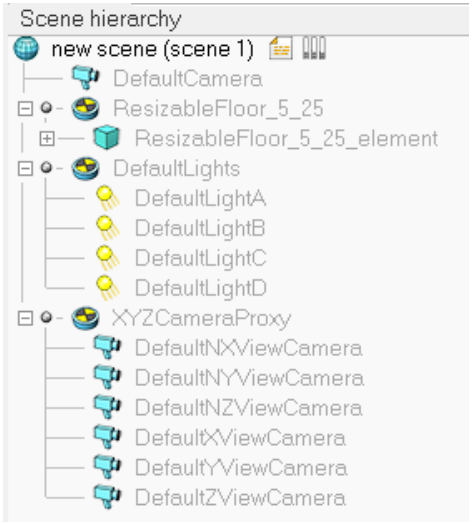
V-REP:: scenes

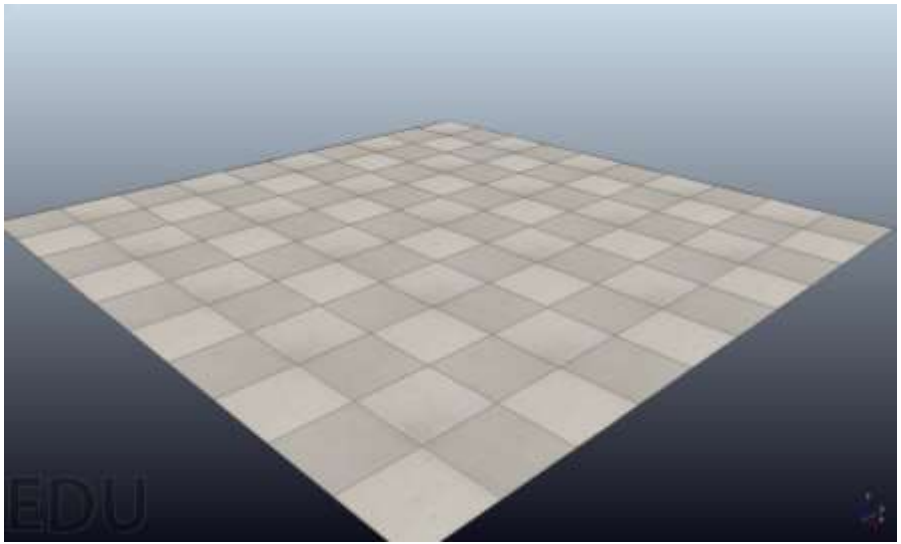
- The environment
- The main script
- Pages and views



V-REP:: scenes:: the environment

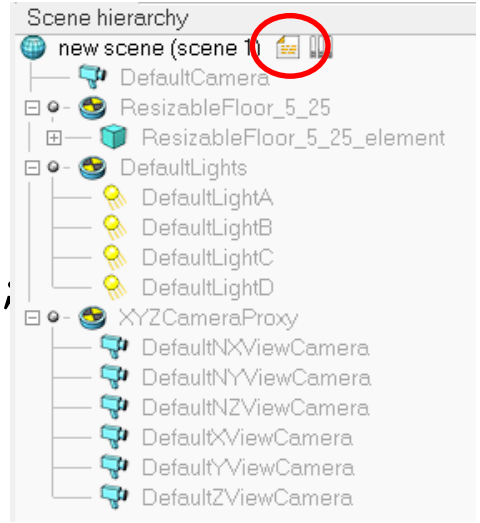
- The environment is composed by properties as ambient light, background color, etc.

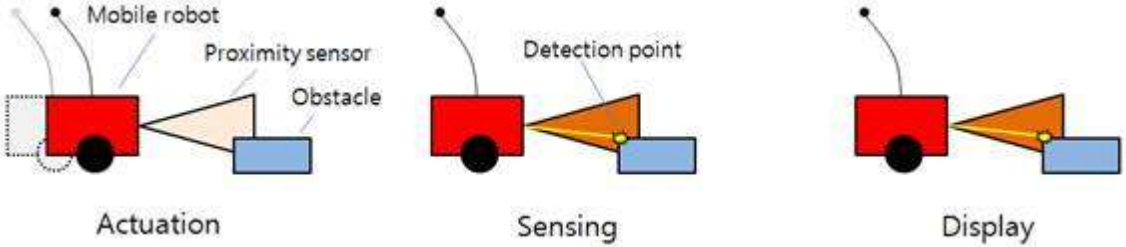




V-REP:: scenes:: main script

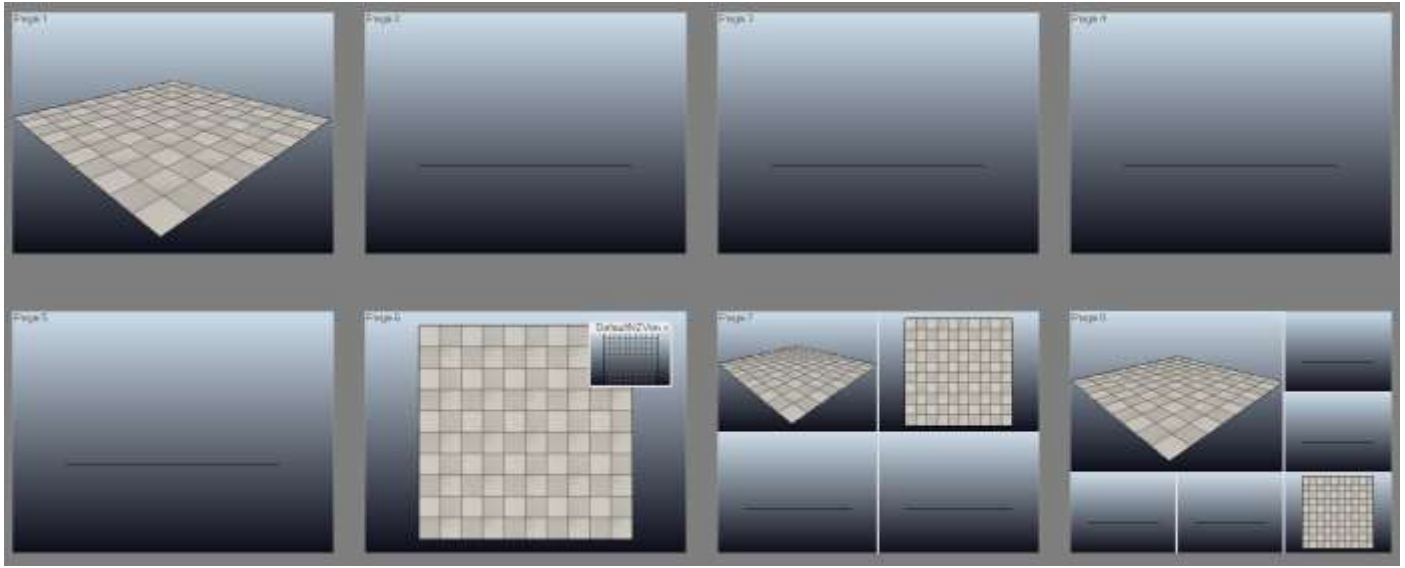
- The main script
  - **the initialization function**: `sysCall_init;`
  - **the actuation function**: `sysCall_actuation;`
  - **the sensing function**: `sysCall_sensing;`
  - **the restoration function**: `sysCall_cleanup.`





V-REP:: scenes:: pages and views

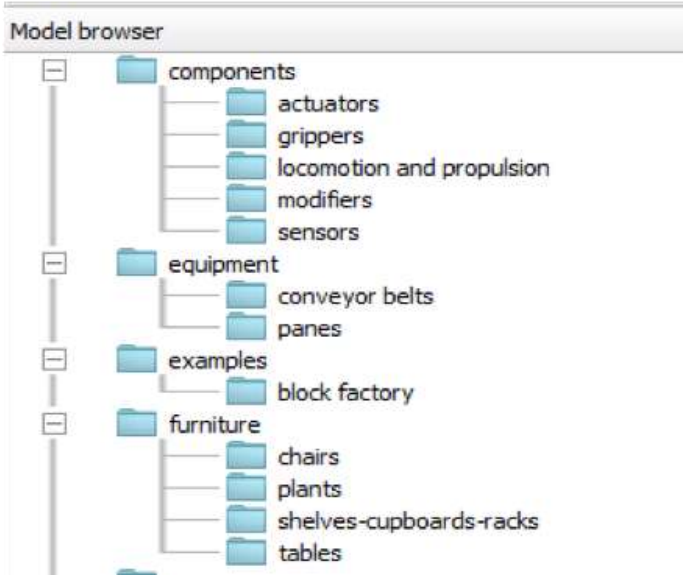
- Pages and views

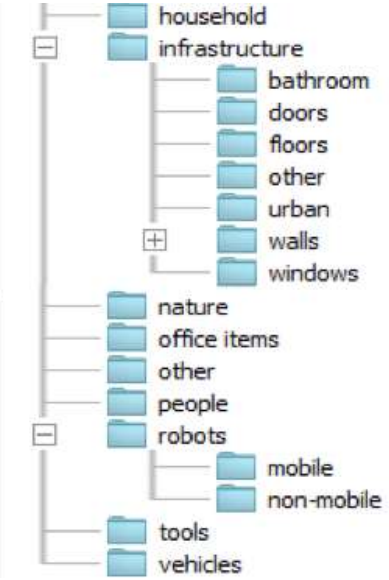


Going to V-REP...

Exploring V-REP

- Exploring a little bit



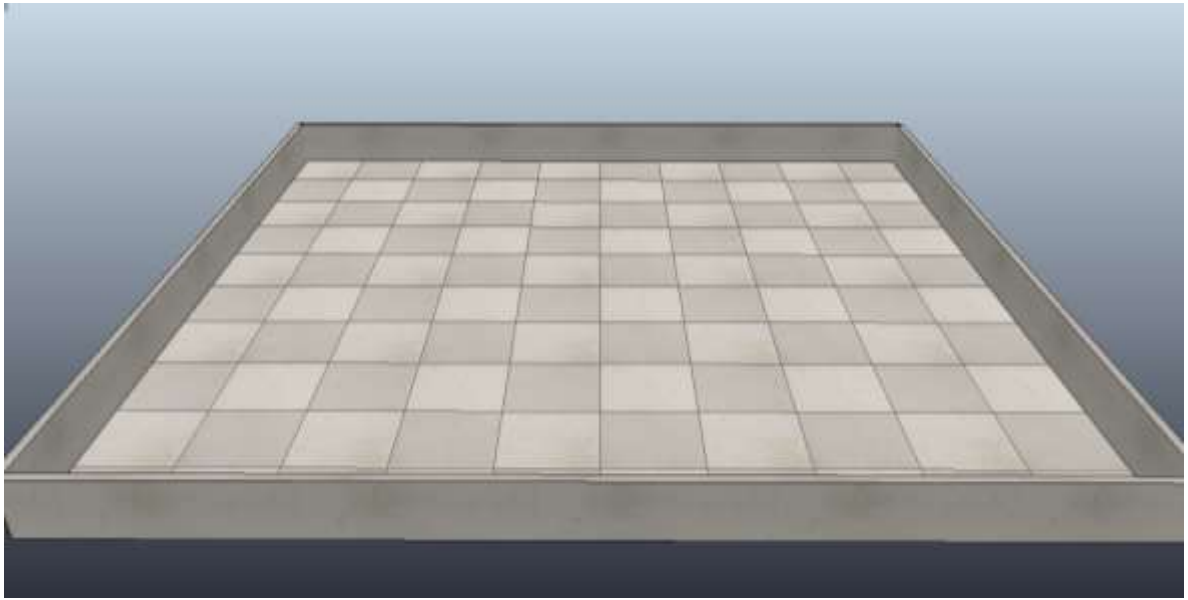


Exploring V-REP

- Exploring a little bit
  - Drag the Pioneer Robot to the scene and... (robots/mobile)

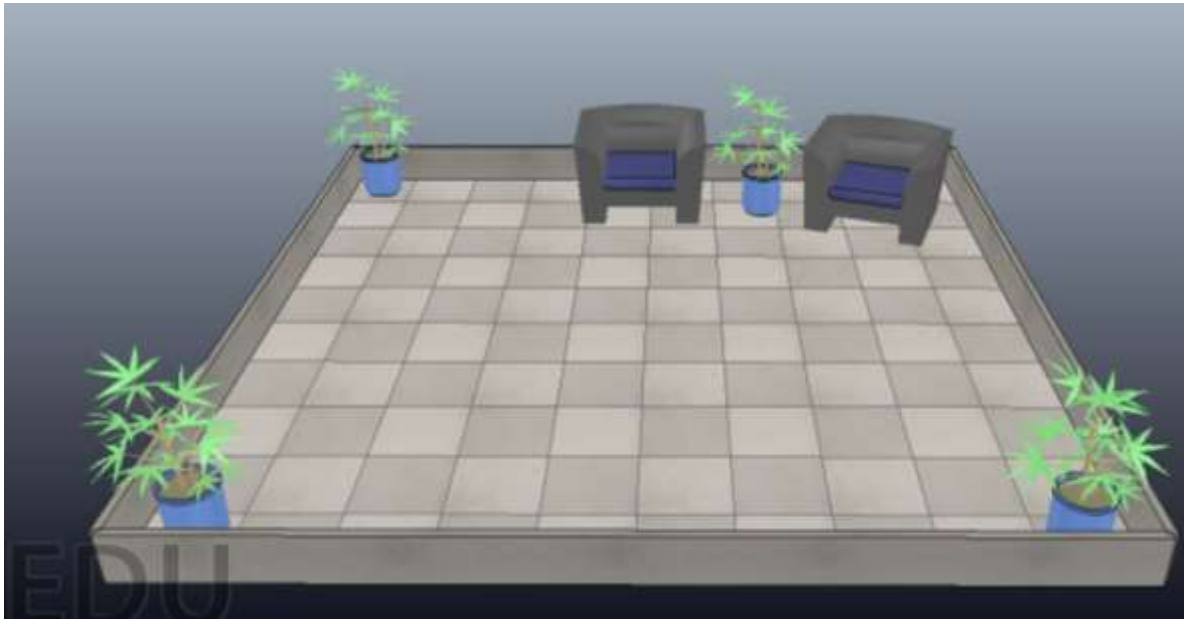
Practice 1: creating scene in V-REP

- Infrastructure/other/resizable concret block



Practice 1: creating scene in V-REP

- Furniture/chairs - plants



Practice 1: creating scene in V-REP

- Robots/mobile

Practice 1: creating scene in V-REP

Practice 2: accessing the image through API

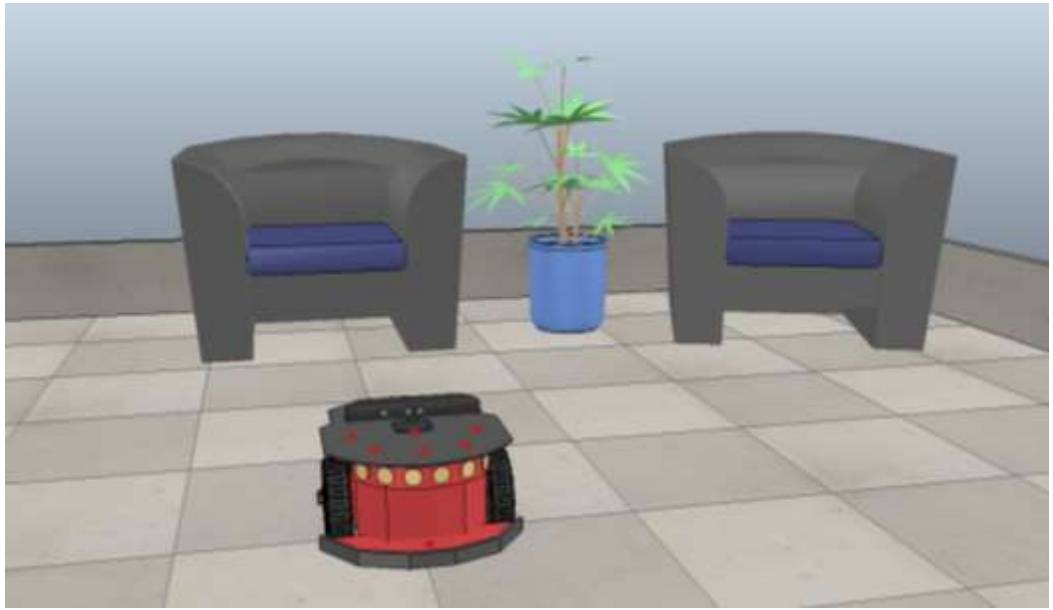
1º) integrate kinect to the scene and associate it with Pioneer

2º) configure Visual Studio with OpenCV and V-REP API

3º) access kinect image by external API

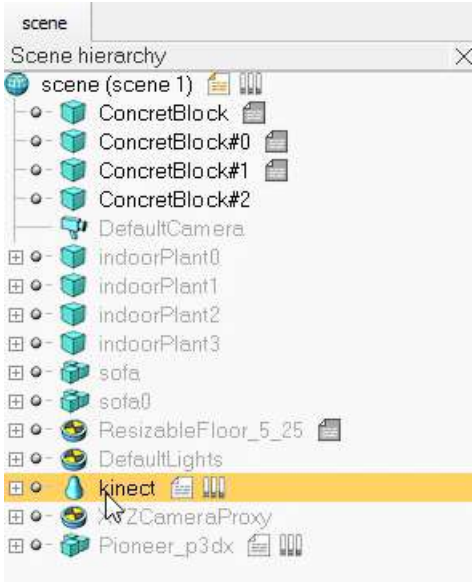
Practice 2: accessing the image through API

- Components/sensors/kinect



Practice 2: accessing the image through API

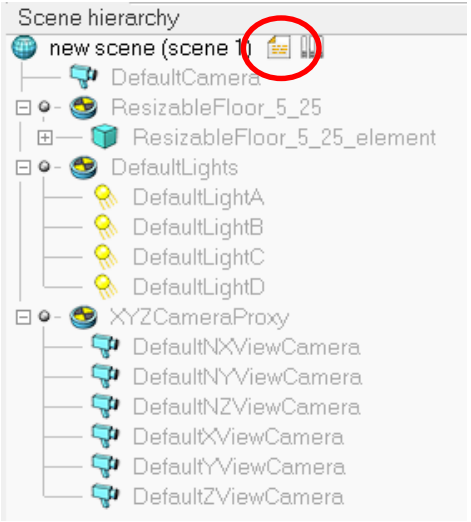
- **Associate the kinect with Pioneer**



Practice 2: accessing the image through API

- Embedded script – main script

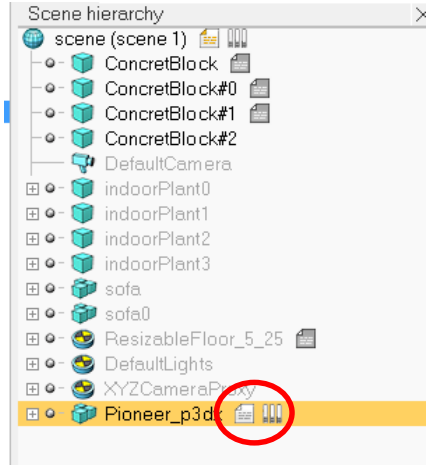
```
11 function sysCall_init()
12     sim.handleSimulationStart()
13     sim.openModule(sim.handle_all)
14     sim.handleGraph(sim.handle_all_except_explicit,0)
15     simRemoteApi(19997)
16
17 end
```



Practice 2: accessing the image through API

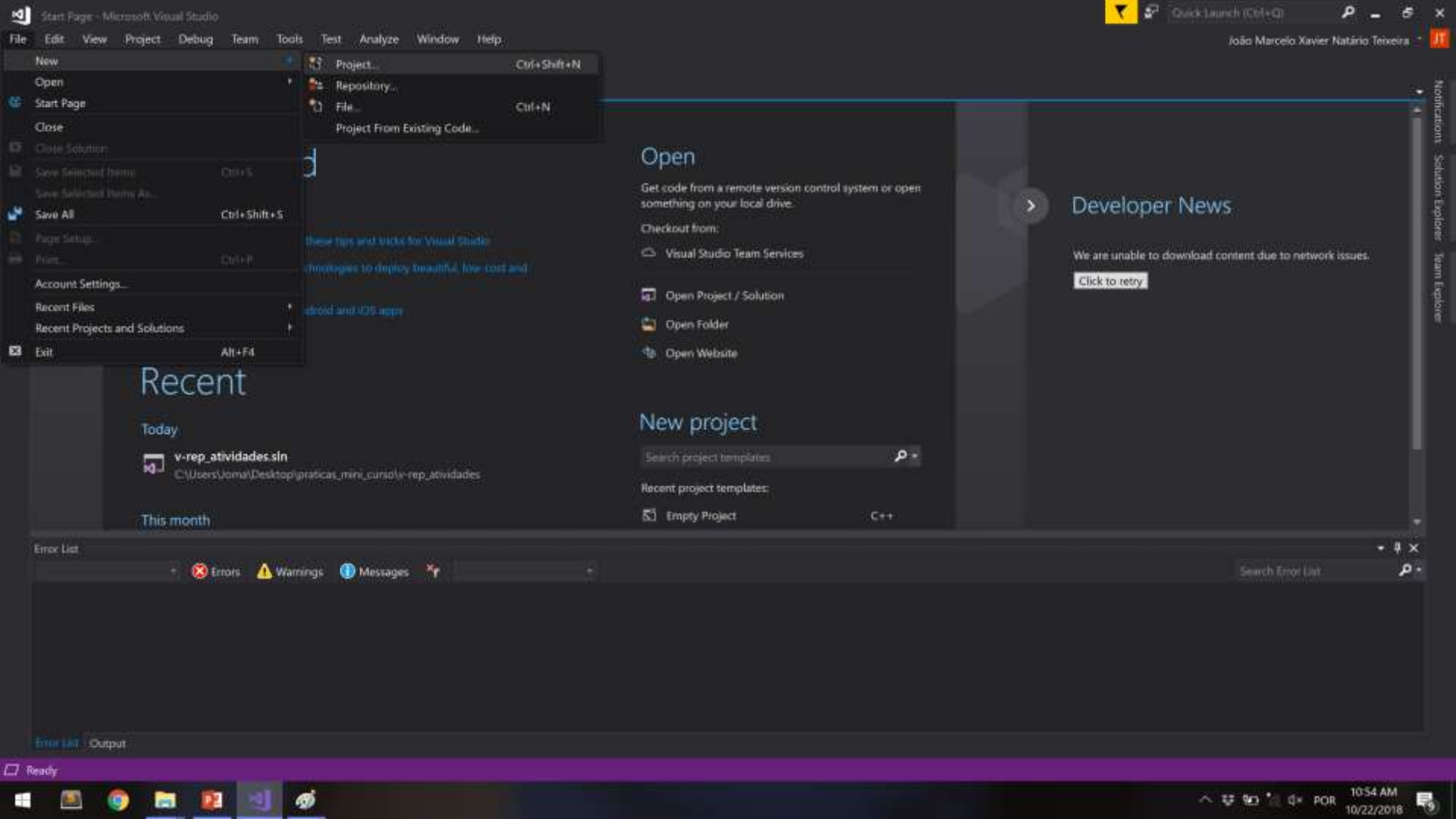
- Embedded script – pioneer robot

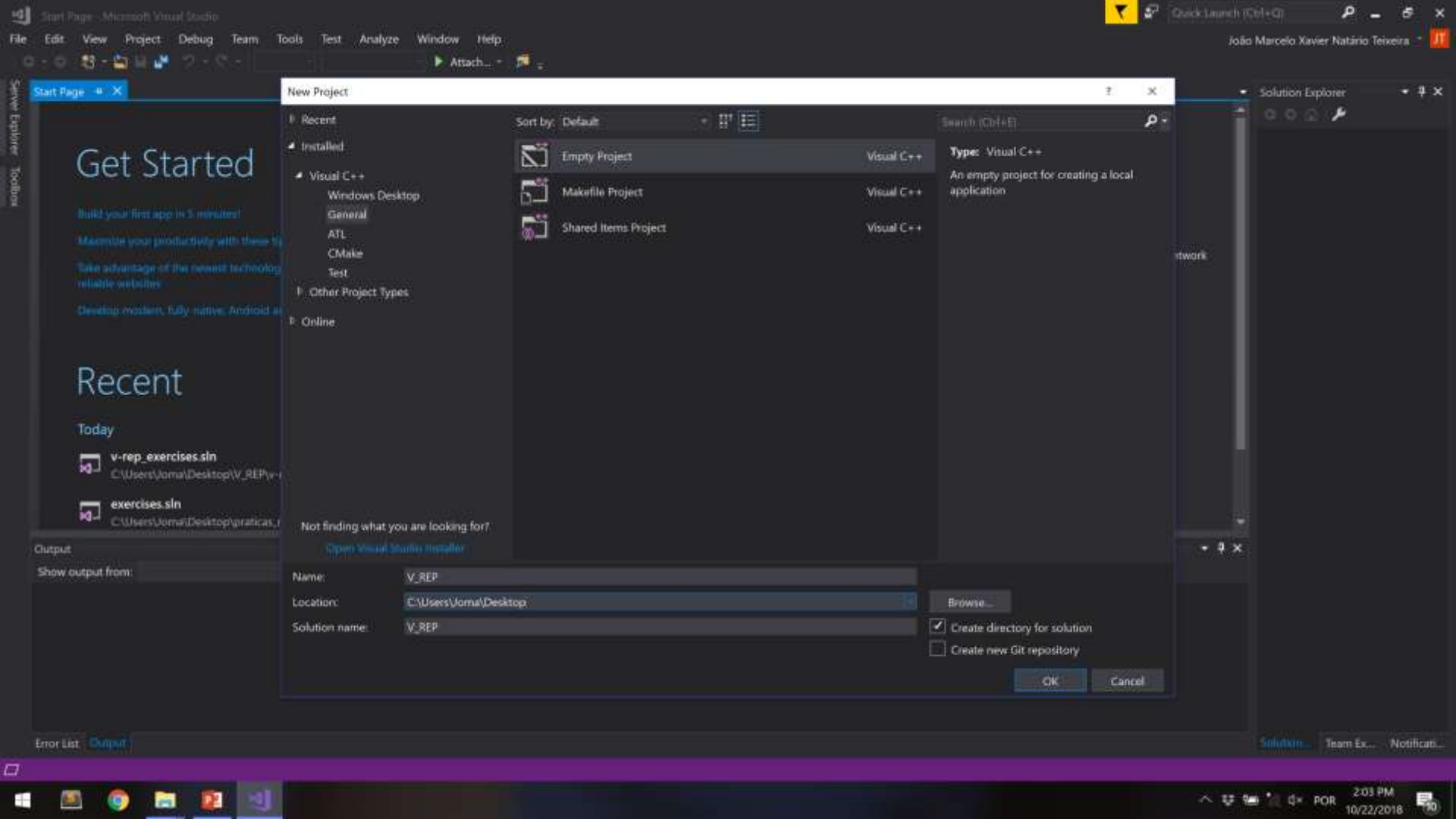
```
function sysCall_init()
    motorLeft=sim.getObjectHandle("Pioneer_p3dx_leftMotor")
    motorRight=sim.getObjectHandle("Pioneer_p3dx_rightMotor")
    vLeft =0;
    vRight=0;
    sim.setJointTargetVelocity(motorLeft,vLeft)
    sim.setJointTargetVelocity(motorRight,vRight)
end
```

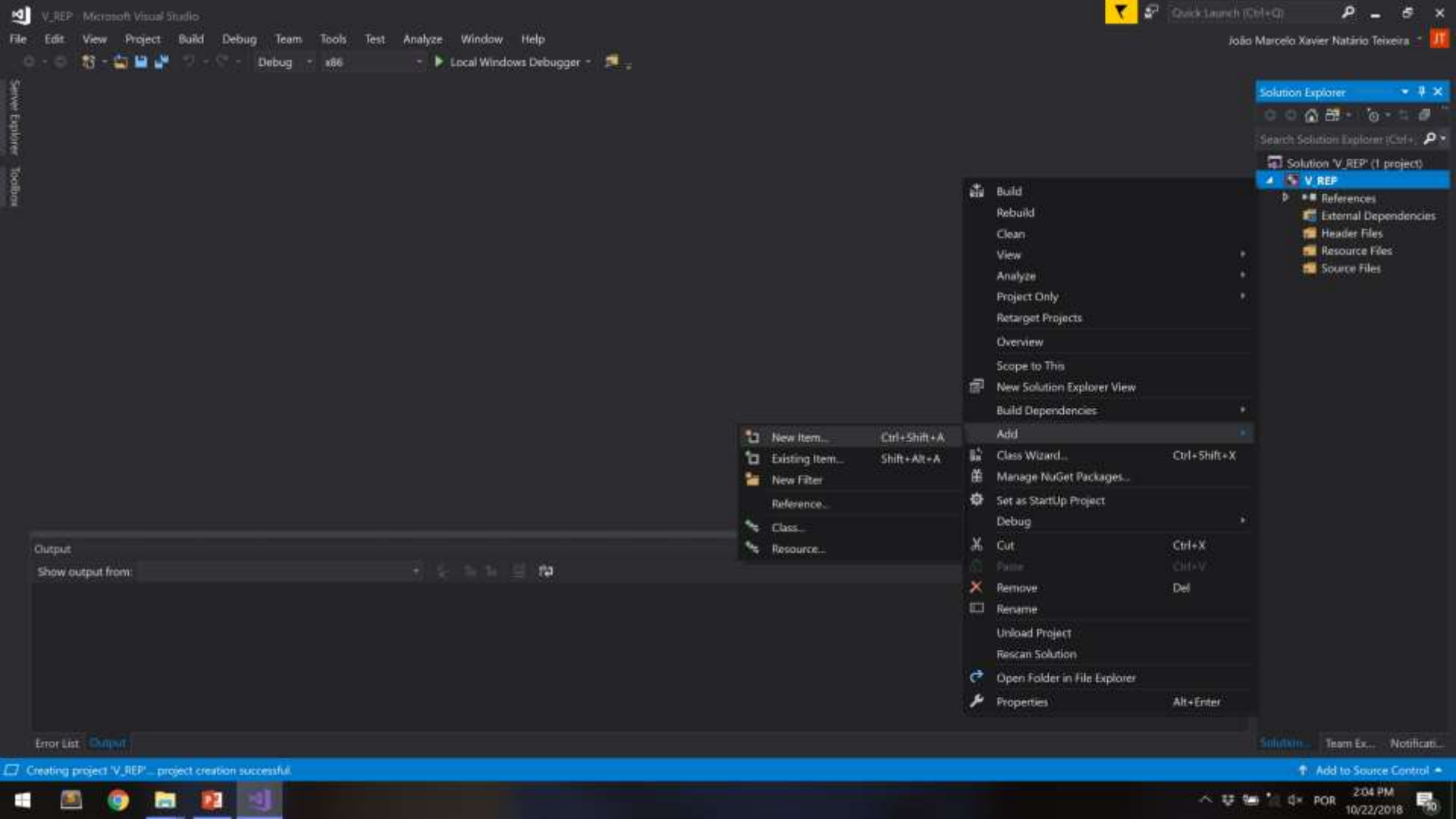


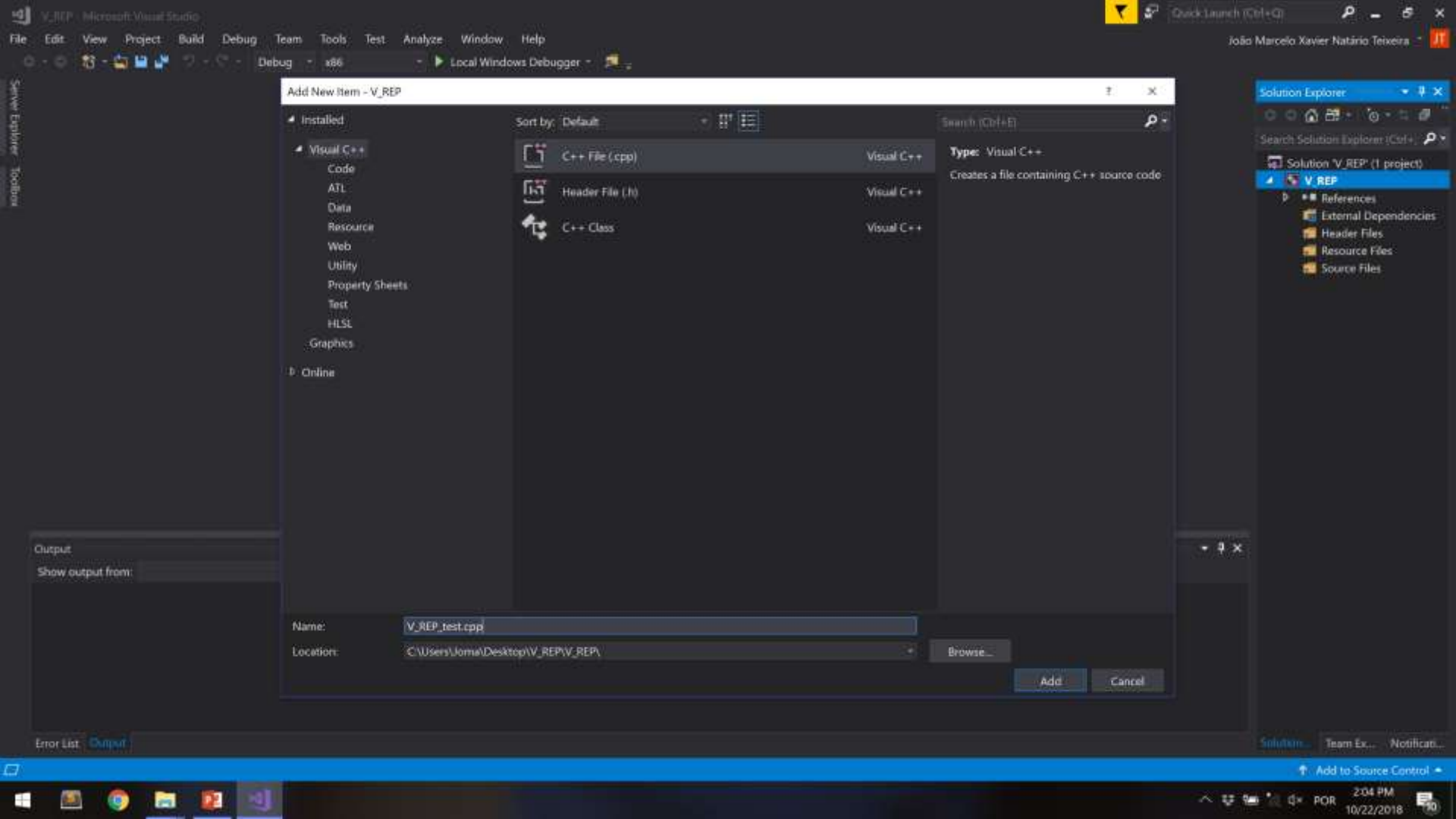
Practice 2: accessing the image through API

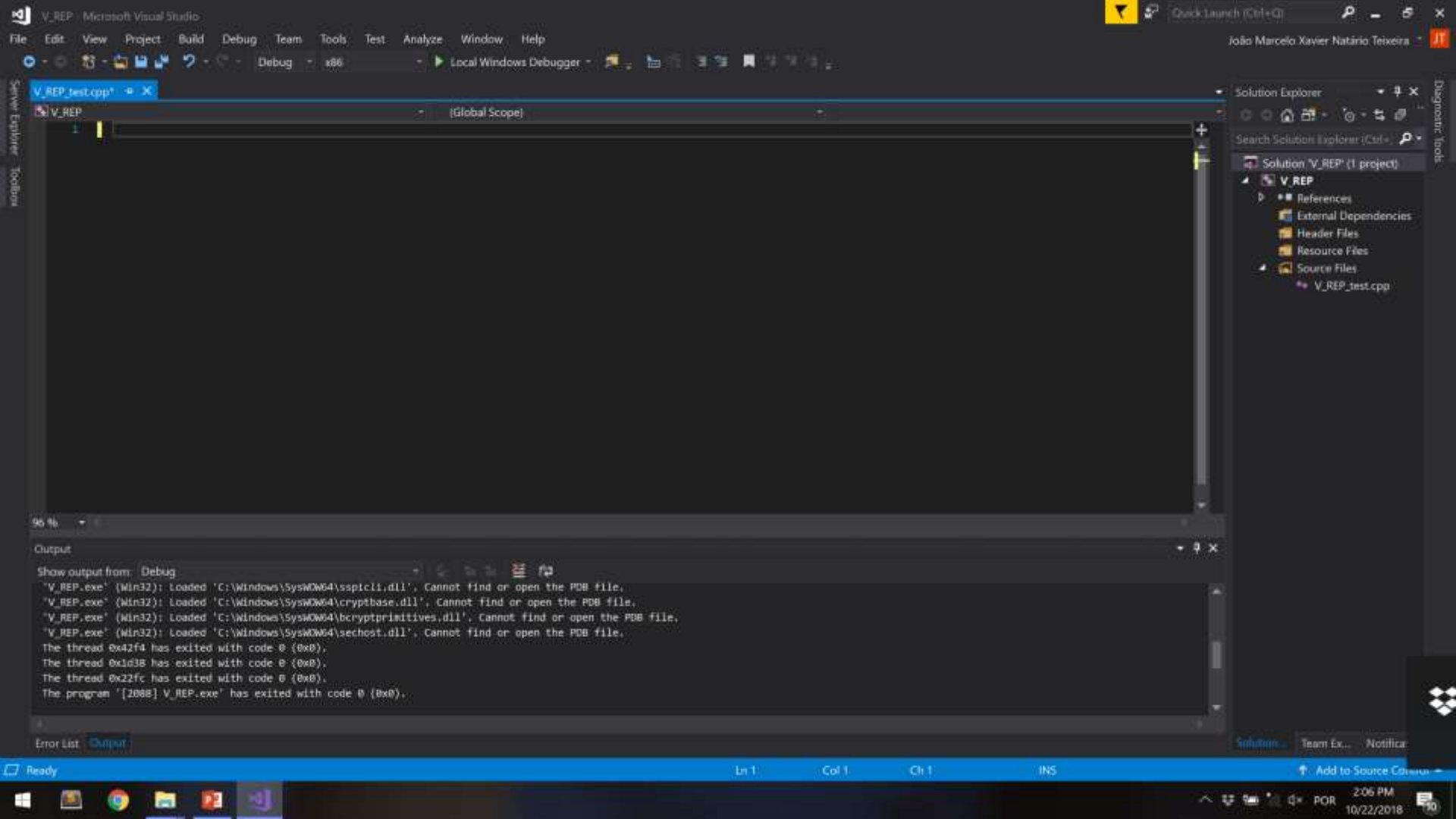
- Going to Visual Studio


Start Page - Microsoft Visual Studio
File Edit View Project Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
New
Open
Start Page
Close
Close Solution
Save Selected Items Ctrl+S
Save Selected Items As...
Save All Ctrl+Shift+S
Page Setup...
Print... Ctrl+P
Account Settings...
Recent Files
Recent Projects and Solutions
Exit Alt+F4
Project... Ctrl+Shift+N
Repository...
File... Ctrl+N
Project From Existing Code...
these tips and tricks for Visual Studio
ch widgets to deploy beautiful, low cost and
droid and iOS apps
Recent
Today
v-rep_atividades.sln
C:\Users\Joma\Desktop\praticas_mini_curso\v-rep_atividades
This month
Open
Get code from a remote version control system or open something on your local drive.
Checkout from:
Visual Studio Team Services
Open Project / Solution
Open Folder
Open Website
New project
Search project templates
Recent project templates:
Empty Project C++
Developer News
We are unable to download content due to network issues.
Click to retry
Notifications
Solution Explorer
Team Explorer
Error List
Errors
Warnings
Messages
Search Error List
Error List
Output
Ready
POR
10:54 AM
10/22/2018

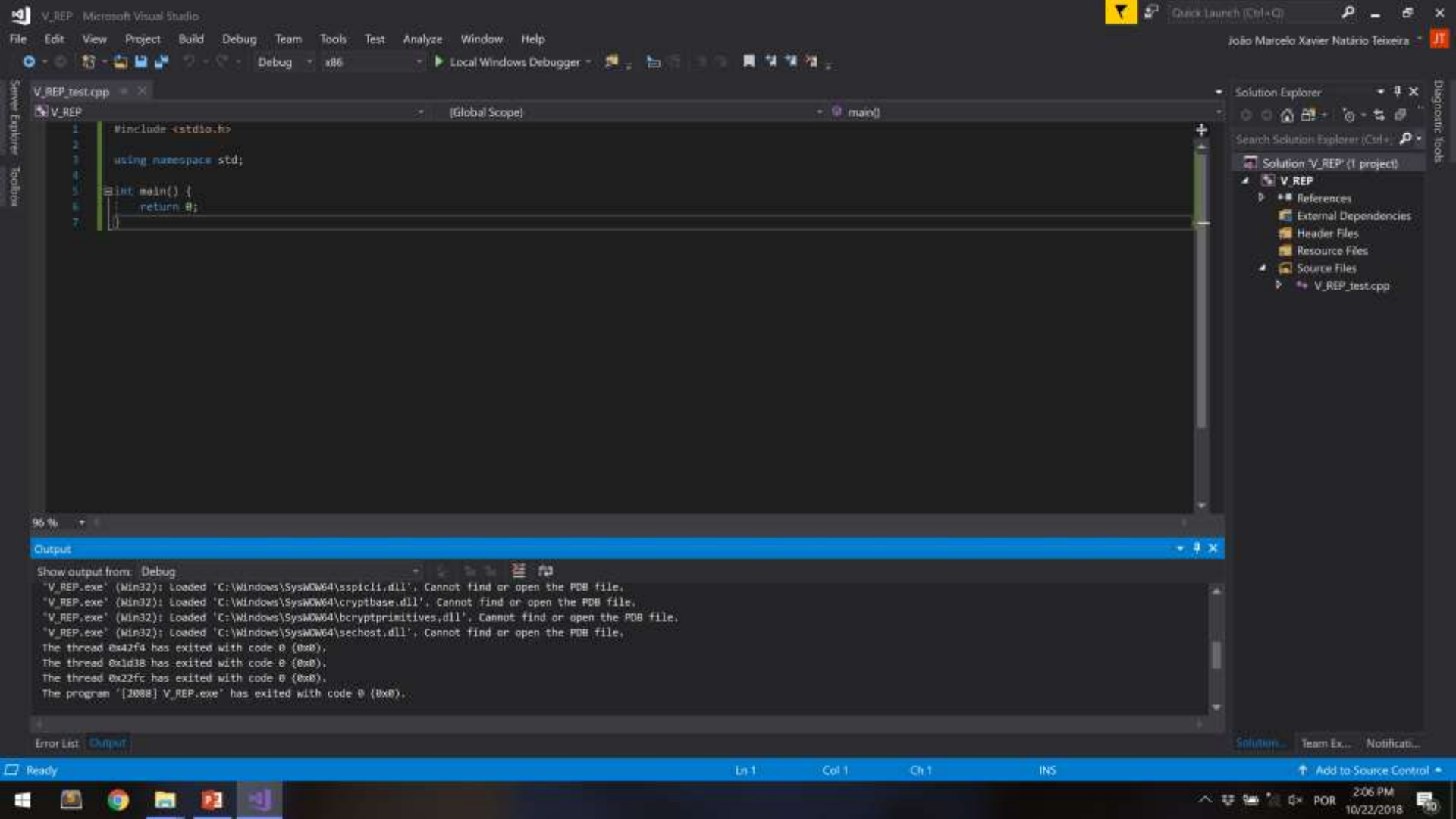

Start Page - Microsoft Visual Studio
File Edit View Project Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Attach...
Start Page
Get Started
Build your first app in 5 minutes!
Recent
Today
v-rep_exercises.sln
exercises.sln
New Project
Recent
Installed
Visual C++
Windows Desktop
General
ATL
CMake
Test
Other Project Types
Online
Sort by: Default
Empty Project Visual C++
Makefile Project Visual C++
Shared Items Project Visual C++
Type: Visual C++
An empty project for creating a local application
Not finding what you are looking for?
Open Visual Studio Installer
Name: V_REP
Location: C:\Users\Joma\Desktop
Solution name: V_REP
Browse...
Create directory for solution
Create new Git repository
OK
Cancel
Solution Explorer
Output
Show output from:
Error List
Output
POR
2:03 PM
10/22/2018


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
Server Explorer Toolbox
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (1 project)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
Build
Rebuild
Clean
View
Analyze
Project Only
Retarget Projects
Overview
Scope to This
New Solution Explorer View
Build Dependencies
Add
Class Wizard... Ctrl+Shift+X
Manage NuGet Packages...
Set as StartUp Project
Debug
Cut Ctrl+X
Paste Ctrl+V
Remove Del
Rename
Unload Project
Rescan Solution
Open Folder in File Explorer
Properties Alt+Enter
New Item... Ctrl+Shift+A
Existing Item... Shift+Alt+A
New Filter
Reference...
Class...
Resource...
Output
Show output from:
Error List Output
Solution... Team Ex... Notificati...
Creating project 'V_REP'... project creation successful
Add to Source Control
POR 2:04 PM 10/22/2018


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
Add New Item - V_REP
Installed
Visual C++
Code
ATL
Data
Resource
Web
Utility
Property Sheets
Test
HLSL
Graphics
Online
Sort by: Default
C++ File (.cpp) Visual C++
Header File (.h) Visual C++
C++ Class Visual C++
Type: Visual C++
Creates a file containing C++ source code
Name: V_REP_test.cpp
Location: C:\Users\Joma\Desktop\V_REP\V_REP\
Browse...
Add
Cancel
Solution Explorer
Solution 'V_REP' (1 project)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
Output
Show output from:
Error List
Output
Add to Source Control
POR
2:04 PM
10/22/2018


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
V_REP_test.cpp*
V_REP (Global Scope)
1
96 %
Output
Show output from: Debug
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sspicli.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\cryptbase.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\bcryptprimitives.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sechost.dll'. Cannot find or open the PDB file.
The thread 0x42f4 has exited with code 0 (0x0).
The thread 0x1d38 has exited with code 0 (0x0).
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (1 project)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
Ready
Ln 1 Col 1 Ch 1 INS
Add to Source Control
POR
2:06 PM
10/22/2018

All right?


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
V_REP_test.cpp
V_REP (Global Scope) main()
#include <stdio.h>
using namespace std;
int main() {
return 0;
}
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (1 project)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
96 %
Output
Show output from: Debug
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sspicli.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\cryptbase.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\bcryptprimitives.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sechost.dll'. Cannot find or open the PDB file.
The thread 0x42f4 has exited with code 0 (0x0).
The thread 0x1d38 has exited with code 0 (0x0).
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Ready Ln 1 Col 1 Ch 1 INS Add to Source Control
POR 2:06 PM 10/22/2018

Practice 2: accessing the image through API

1º) integrate kinect to the scene and associate it with Pioneer

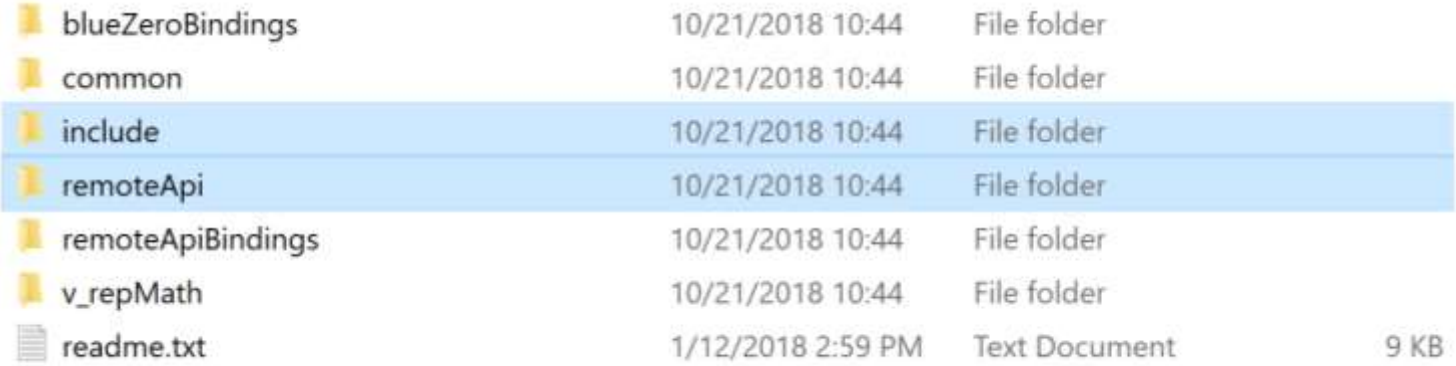
2º) configure visual studio with OpenCV and V-REP API

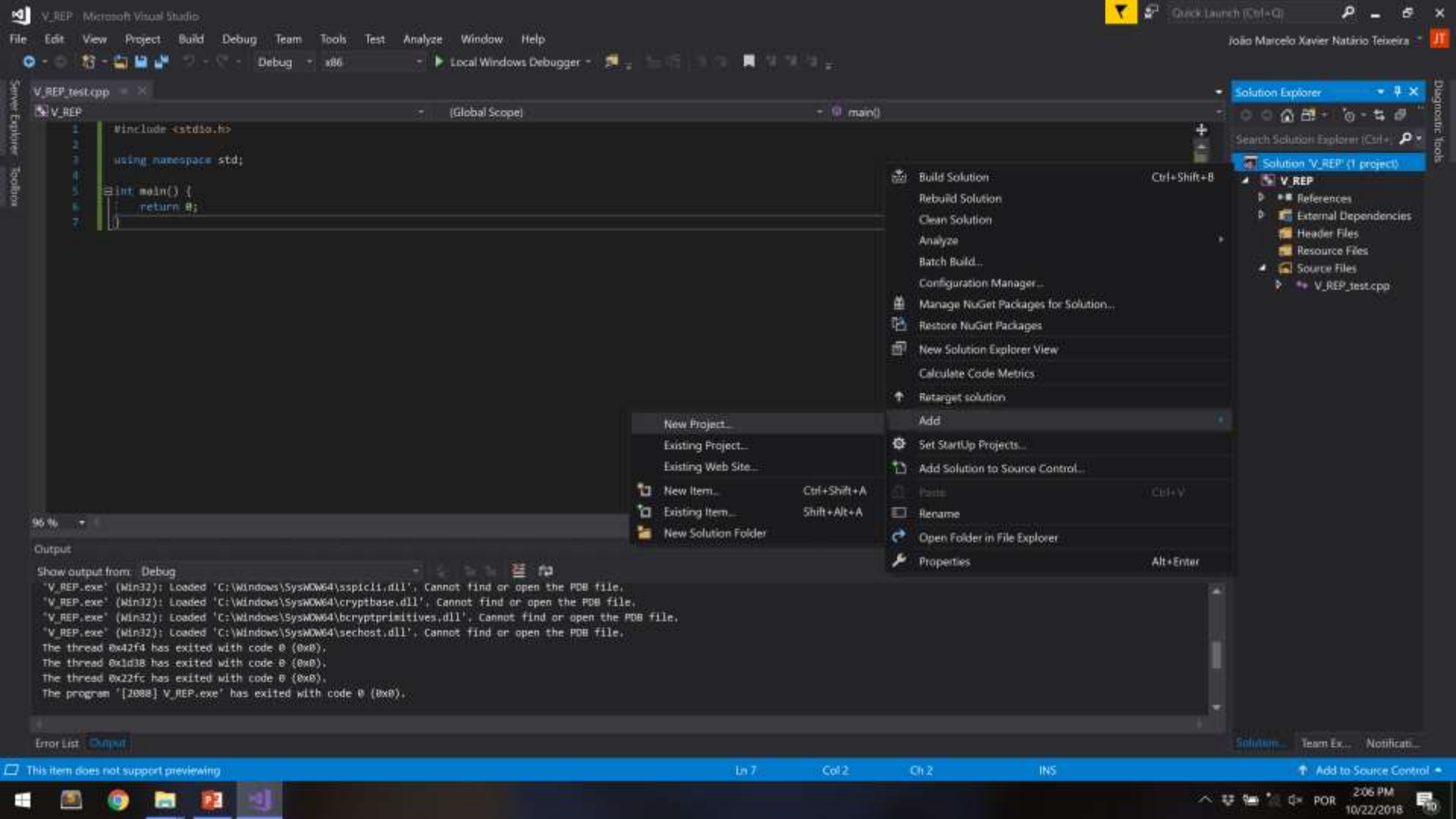
3º) access kinect image by external API

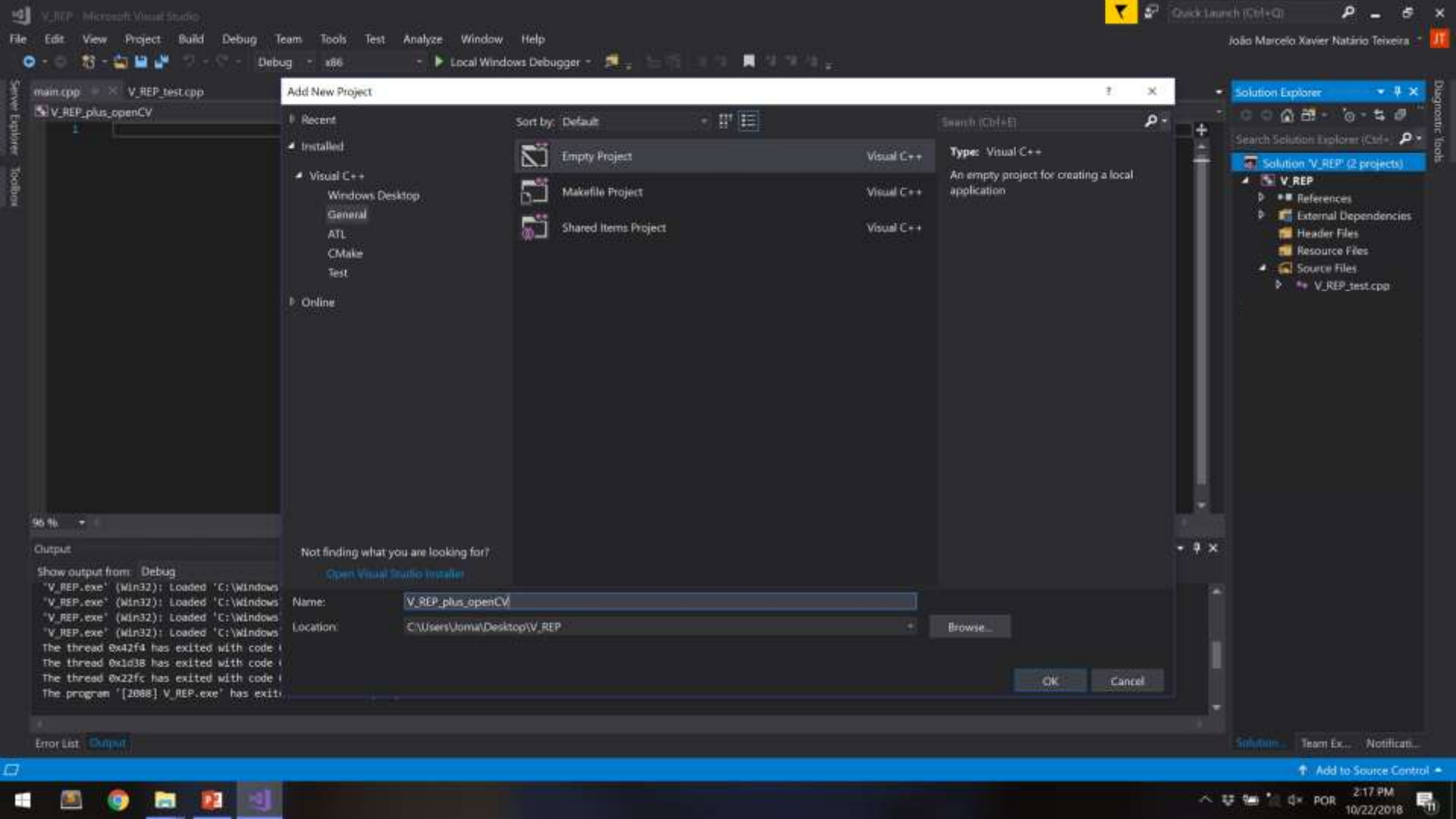
Dependencies folder

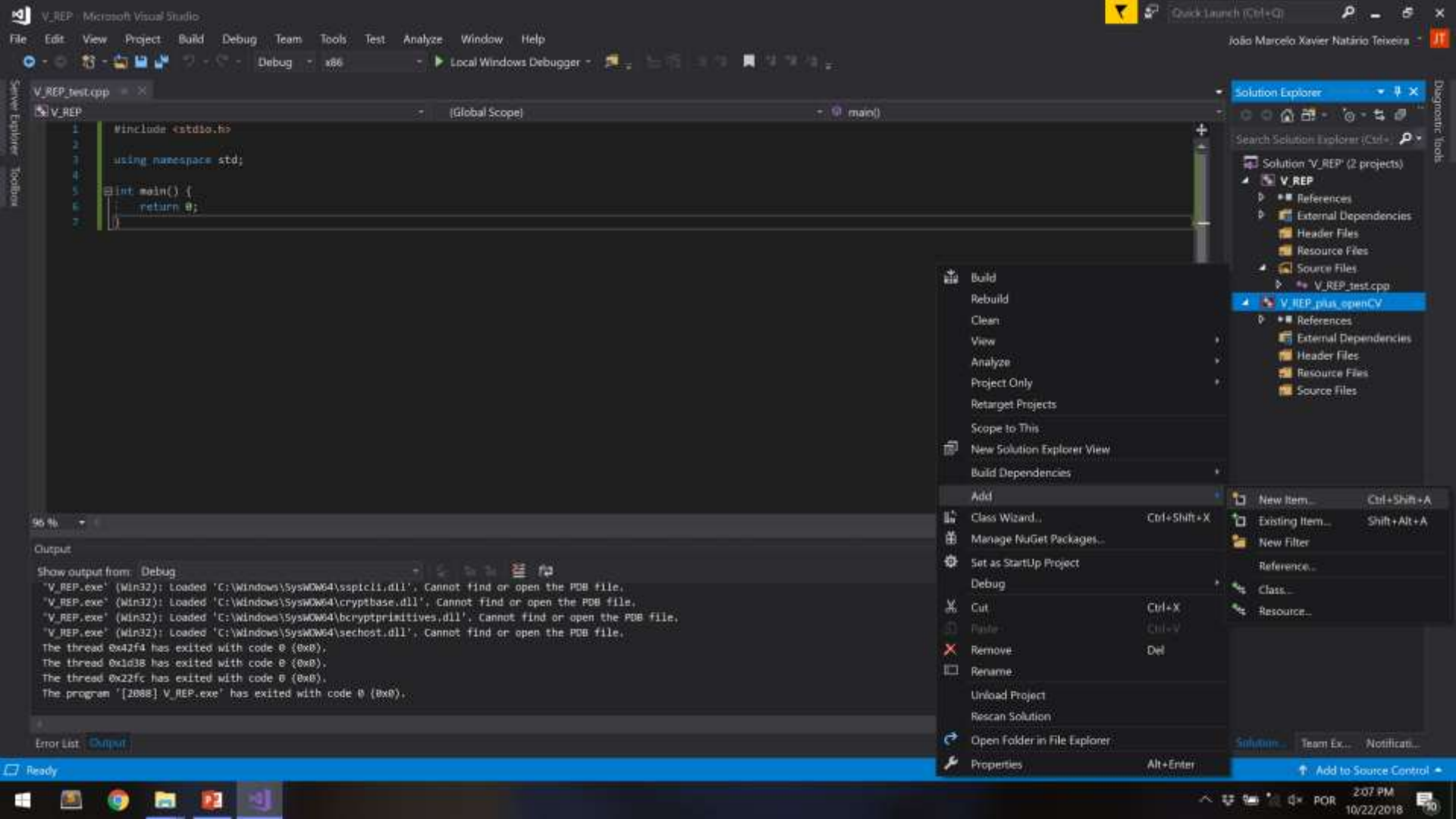
/v-rep

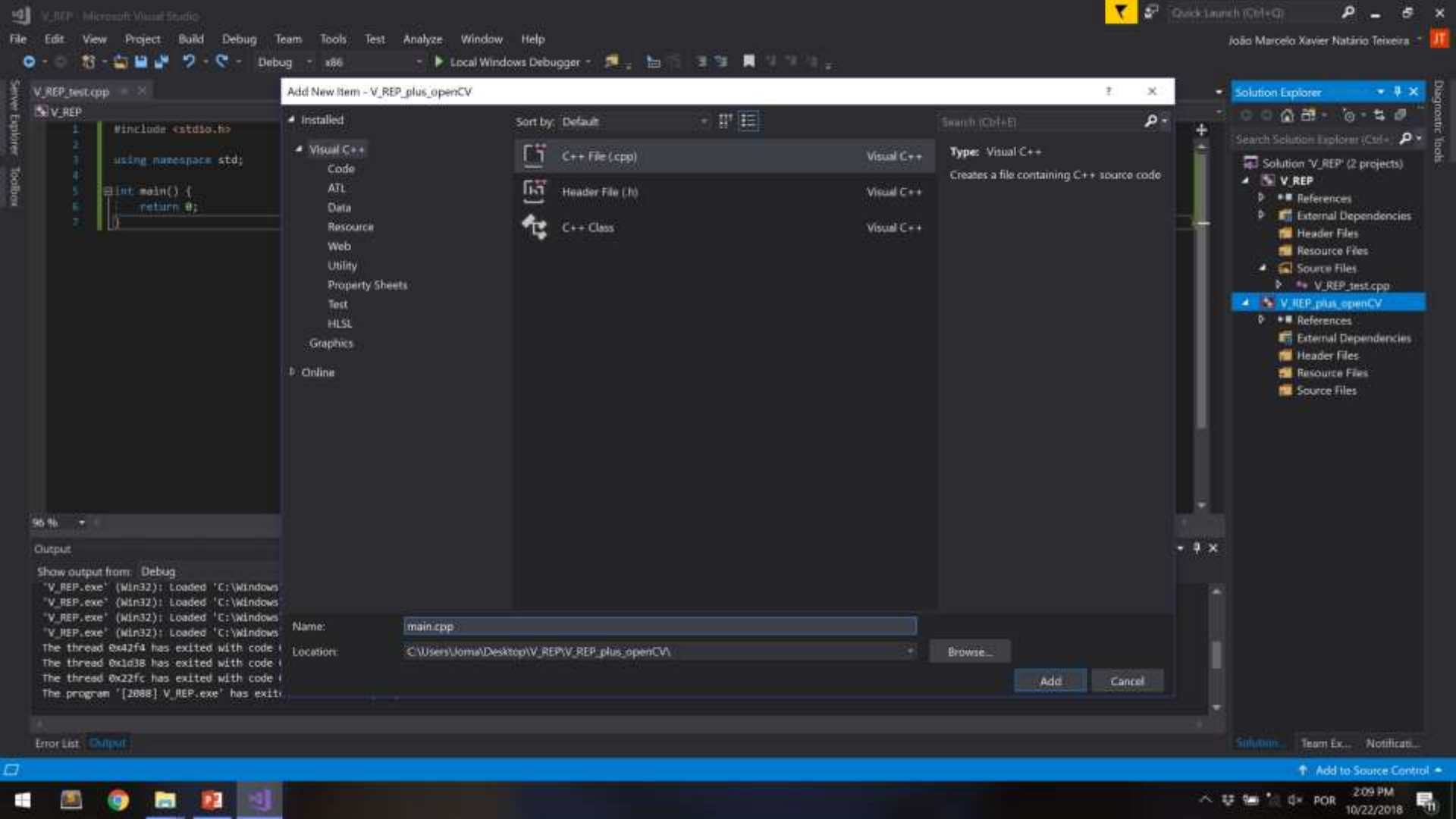
- C:\Program Files\V-REP3\V-REP_PRO_EDU\programming

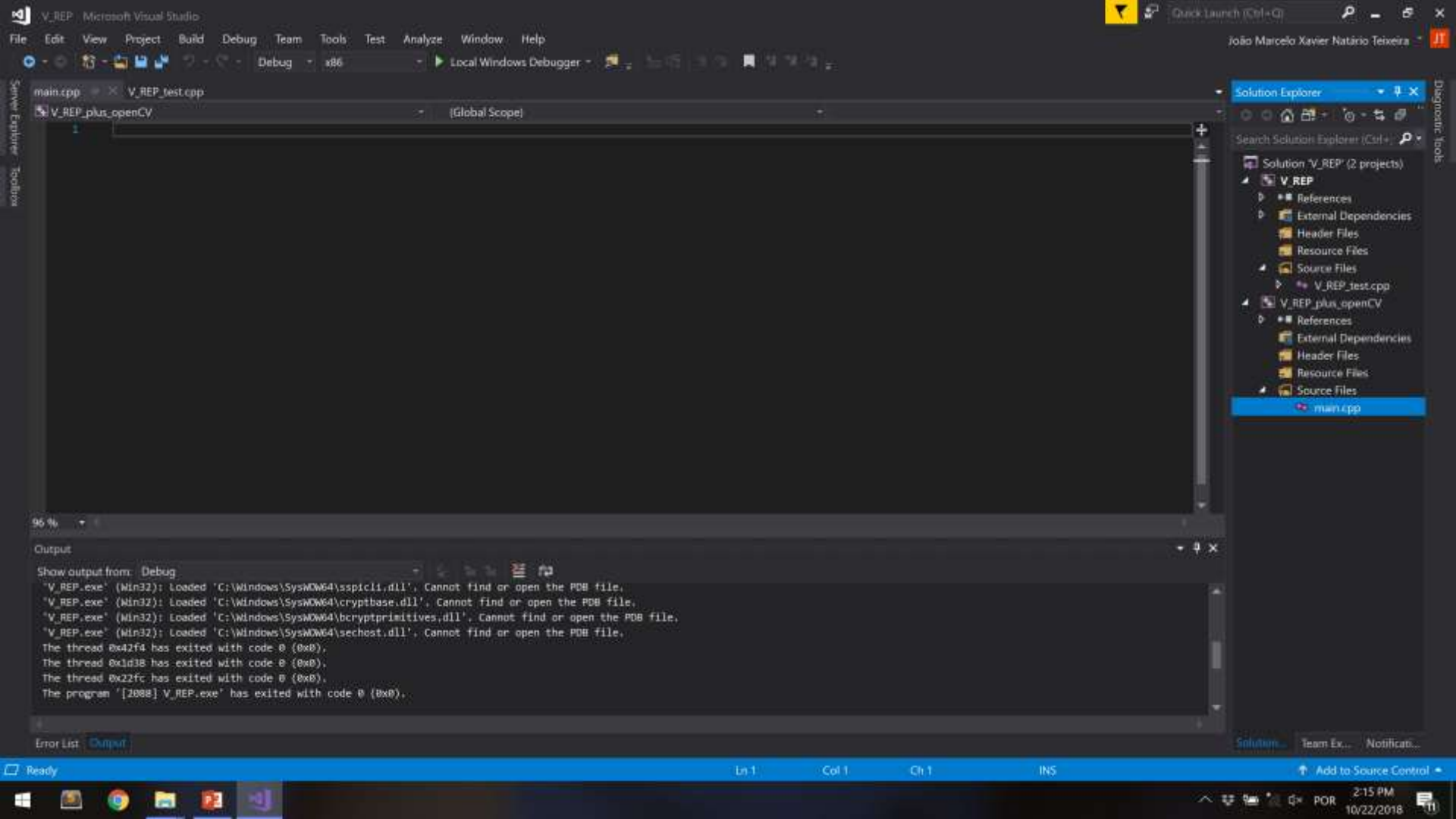



V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
V_REP_test.cpp
V_REP (Global Scope) main()
#include <stdio.h>
using namespace std;
int main() {
return 0;
}
Build Solution Ctrl+Shift+B
Rebuild Solution
Clean Solution
Analyze
Batch Build...
Configuration Manager...
Manage NuGet Packages for Solution...
Restore NuGet Packages
New Solution Explorer View
Calculate Code Metrics
Retarget solution
Add
Set StartUp Projects...
Add Solution to Source Control...
Paste Ctrl+V
Rename
Open Folder in File Explorer
Properties Alt+Enter
New Project...
Existing Project...
Existing Web Site...
New Item... Ctrl+Shift+A
Existing Item... Shift+Alt+A
New Solution Folder
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (1 project)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
Output
Show output from: Debug
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sspicli.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\cryptbase.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\bcryptprimitives.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sechost.dll'. Cannot find or open the PDB file.
The thread 0x42f4 has exited with code 0 (0x0).
The thread 0x1d38 has exited with code 0 (0x0).
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
This item does not support previewing
Ln 7 Col 2 Ch 2 INS
Add to Source Control
POR 2:06 PM 10/22/2018


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp V_REP_test.cpp
V_REP_plus_openCV
Add New Project
Recent
Installed
Visual C++
Windows Desktop
General
ATL
CMake
Test
Online
Sort by: Default
Empty Project Visual C++
Makefile Project Visual C++
Shared Items Project Visual C++
Type: Visual C++
An empty project for creating a local application
Not finding what you are looking for?
Open Visual Studio Installer
Name: V_REP_plus_openCV
Location: C:\Users\toma\Desktop\V_REP
Browse...
OK
Cancel
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
Output
Show output from: Debug
'V_REP.exe' (Win32): Loaded 'C:\Windows
'V_REP.exe' (Win32): Loaded 'C:\Windows
'V_REP.exe' (Win32): Loaded 'C:\Windows
'V_REP.exe' (Win32): Loaded 'C:\Windows
The thread 0x42f4 has exited with code
The thread 0x1d38 has exited with code
The thread 0x22fc has exited with code
The program '[2088] V_REP.exe' has exit
Error List Output
Add to Source Control
POR 2:17 PM 10/22/2018

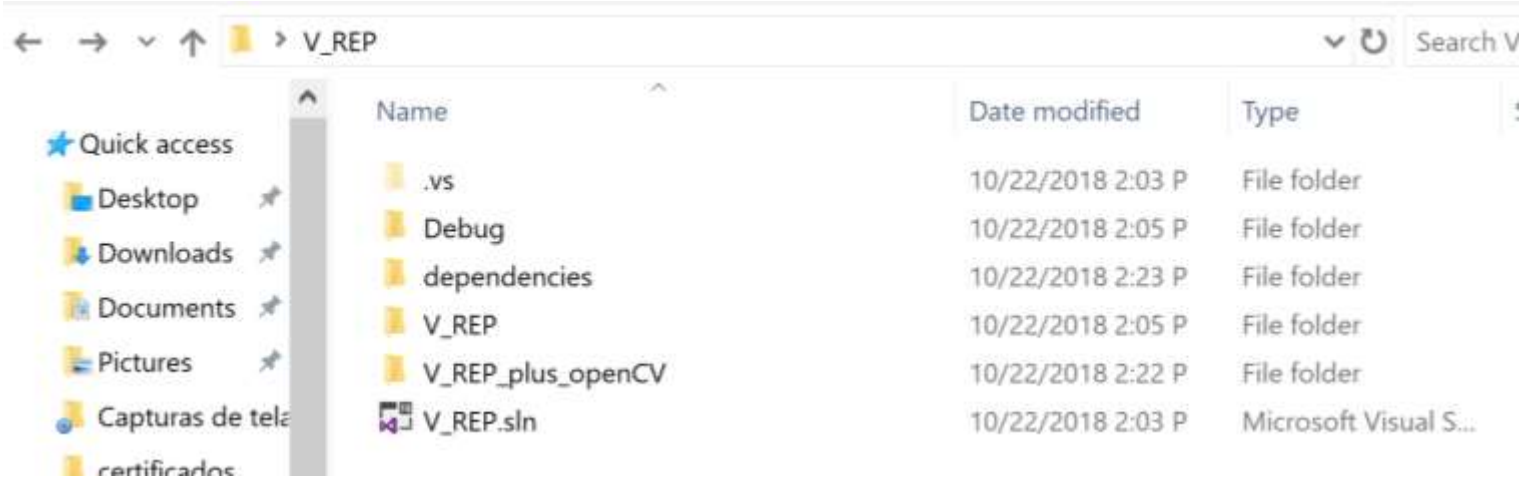

V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
V_REP_test.cpp
V_REP (Global Scope) main()
#include <stdio.h>
using namespace std;
int main() {
return 0;
}
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
Build
Rebuild
Clean
View
Analyze
Project Only
Retarget Projects
Scope to This
New Solution Explorer View
Build Dependencies
Add
Class Wizard... Ctrl+Shift+X
Manage NuGet Packages...
Set as StartUp Project
Debug
Cut Ctrl+X
Paste Ctrl+V
Remove Del
Rename
Unload Project
Rescan Solution
Open Folder in File Explorer
Properties Alt+Enter
New Item... Ctrl+Shift+A
Existing Item... Shift+Alt+A
New Filter
Reference...
Class...
Resource...
96 %
Output
Show output from: Debug
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sspicli.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\cryptbase.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\bcryptprimitives.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sechost.dll'. Cannot find or open the PDB file.
The thread 0x42f4 has exited with code 0 (0x0).
The thread 0x1d38 has exited with code 0 (0x0).
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Ready
Add to Source Control
POR 2:07 PM 10/22/2018

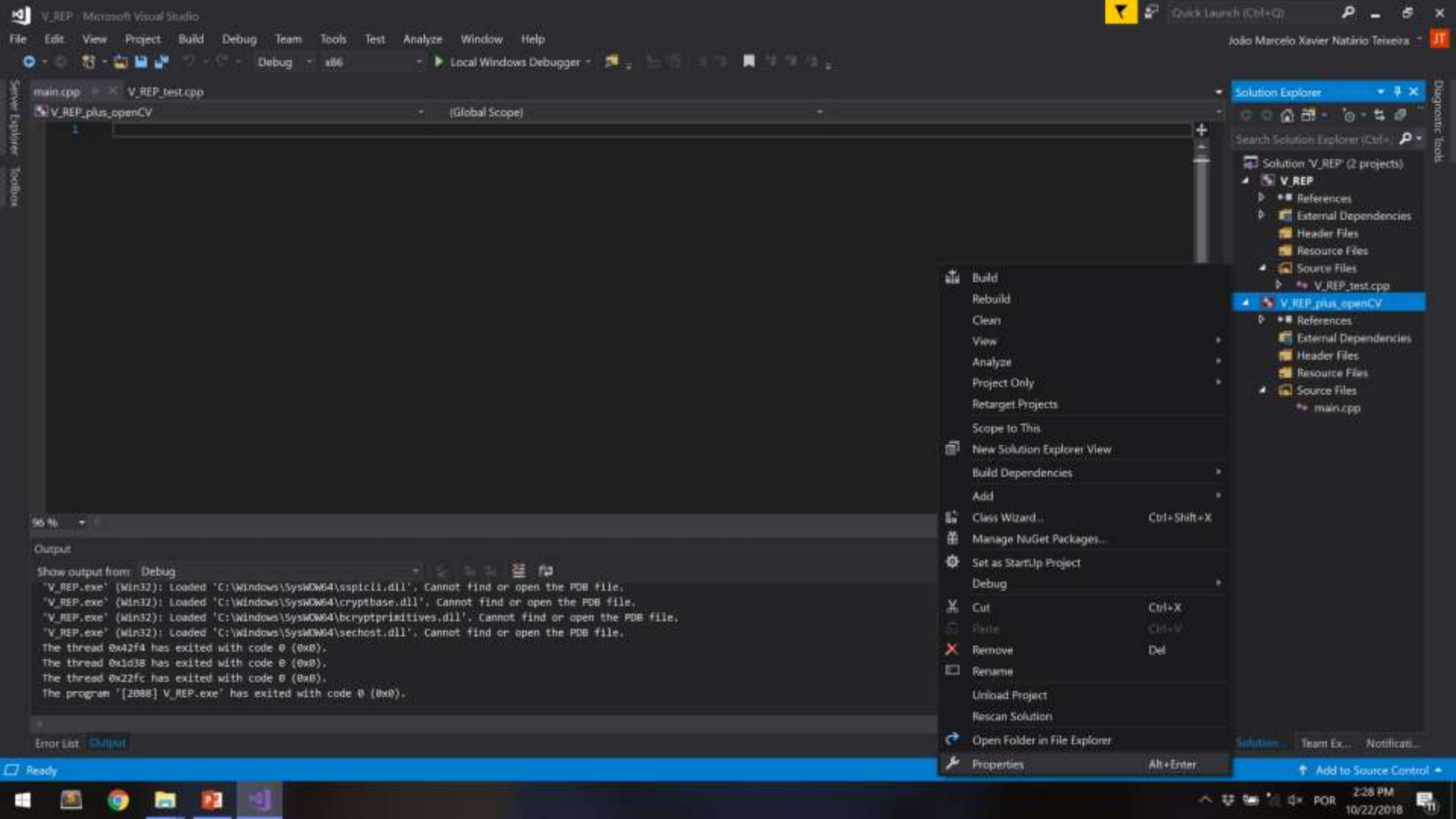

V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
V_REP_test.cpp
V_REP
#include <stdio.h>
using namespace std;
int main() {
return 0;
}
Add New Item - V_REP_plus_openCV
Installed
Visual C++
Code
ATL
Data
Resource
Web
Utility
Property Sheets
Test
HLSL
Graphics
Online
Sort by: Default
C++ File (.cpp) Visual C++
Header File (.h) Visual C++
C++ Class Visual C++
Type: Visual C++
Creates a file containing C++ source code
Name: main.cpp
Location: C:\Users\Joma\Desktop\V_REP\V_REP_plus_openCV\
Browse...
Add
Cancel
Solution Explorer
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
Output
Show output from: Debug
'V_REP.exe' (Win32): Loaded 'C:\Windows
'V_REP.exe' (Win32): Loaded 'C:\Windows
'V_REP.exe' (Win32): Loaded 'C:\Windows
'V_REP.exe' (Win32): Loaded 'C:\Windows
The thread 0x42f4 has exited with code
The thread 0x1d38 has exited with code
The thread 0x22fc has exited with code
The program '[2088] V_REP.exe' has exit
Error List Output
Add to Source Control
POR 2:09 PM 10/22/2018

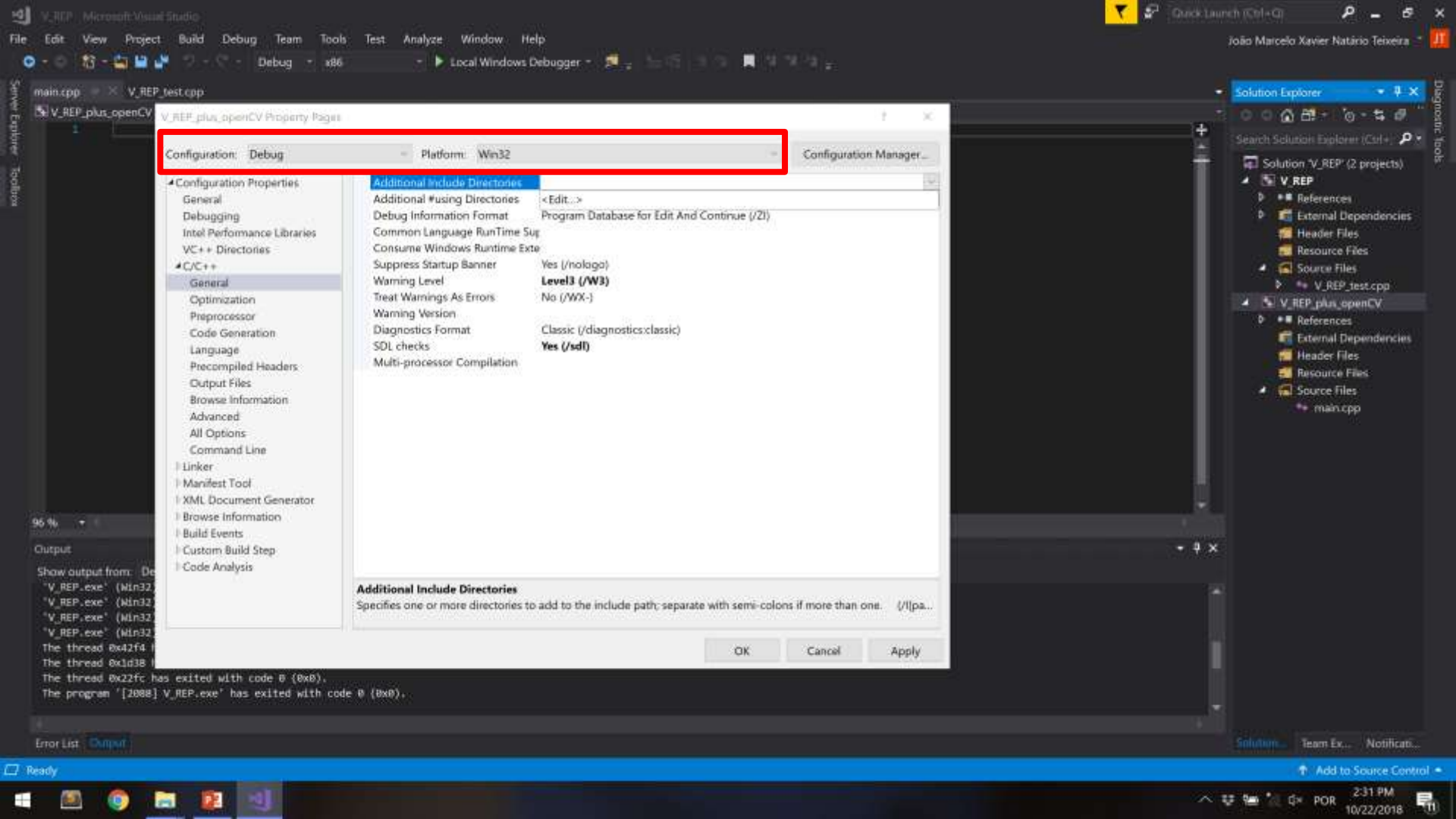

V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp V_REP_test.cpp
V_REP_plus_openCV (Global Scope)
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
96 %
Output
Show output from: Debug
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sspicli.dll', Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\cryptbase.dll', Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\bcryptprimitives.dll', Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sechost.dll', Cannot find or open the PDB file.
The thread 0x42f4 has exited with code 0 (0x0).
The thread 0x1d38 has exited with code 0 (0x0).
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Ready
Ln 1 Col 1 Ch 1 INS
Add to Source Control
POR 2:15 PM 10/22/2018

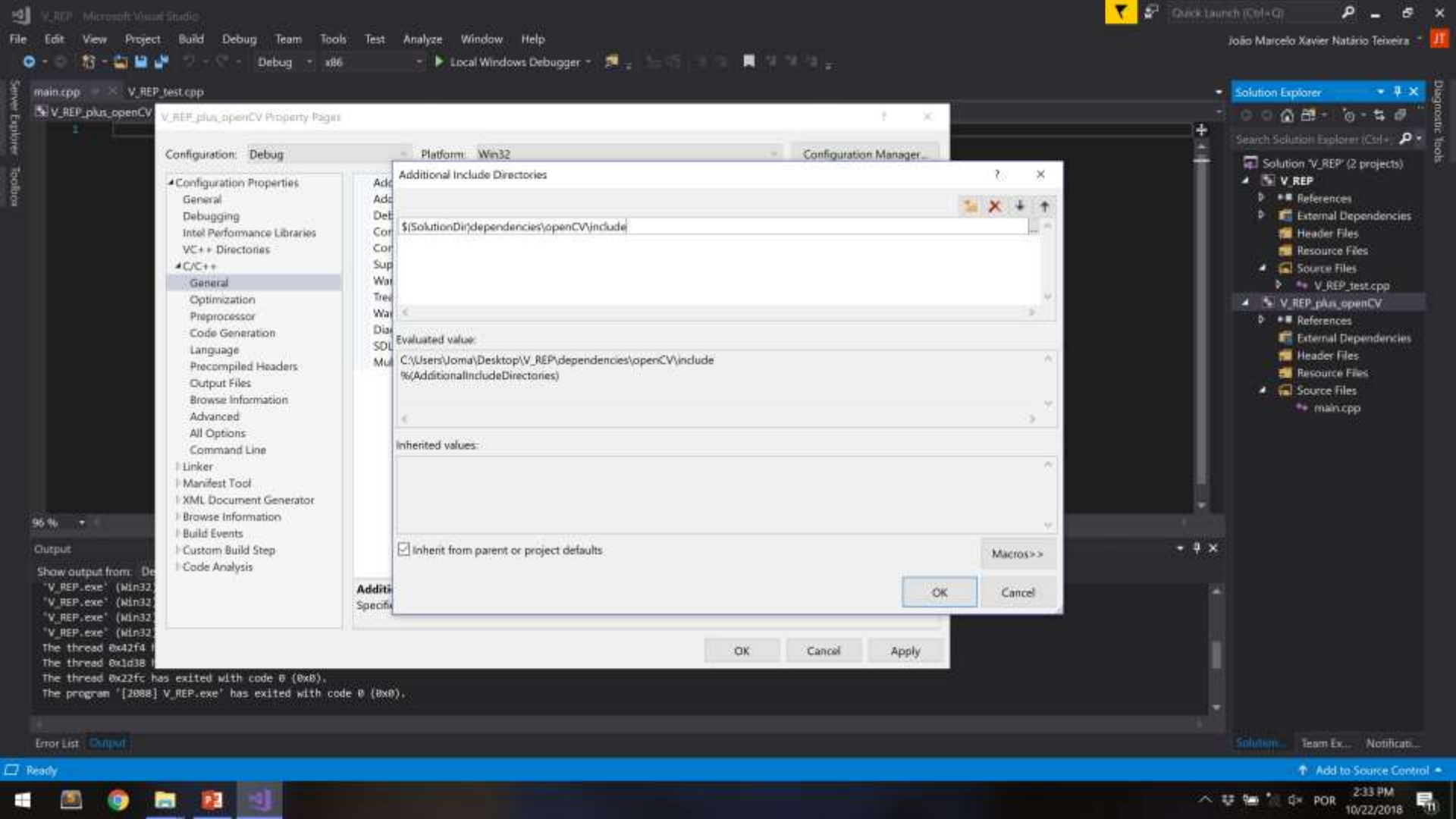
OBS

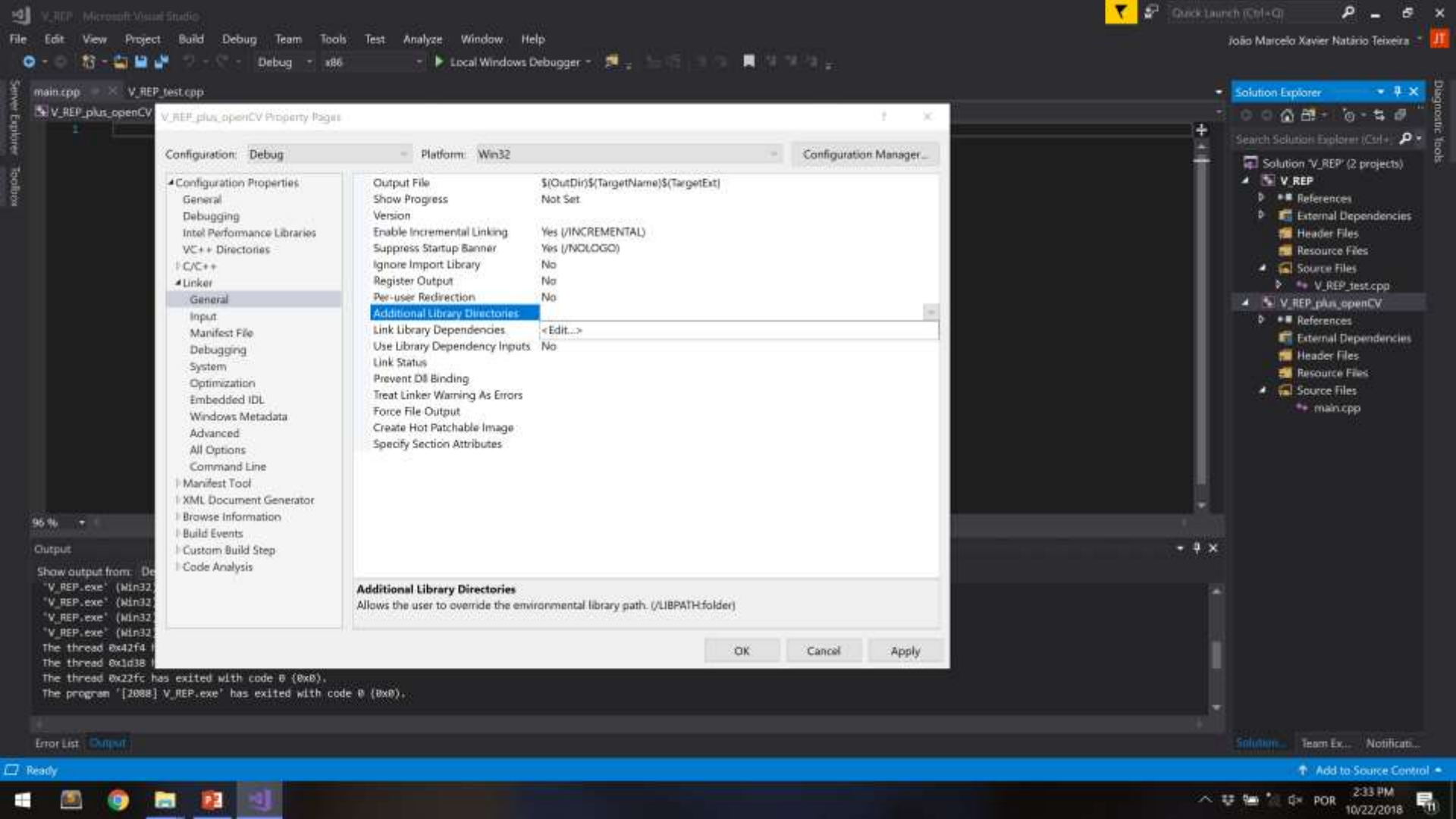
- $(SolutionDir)

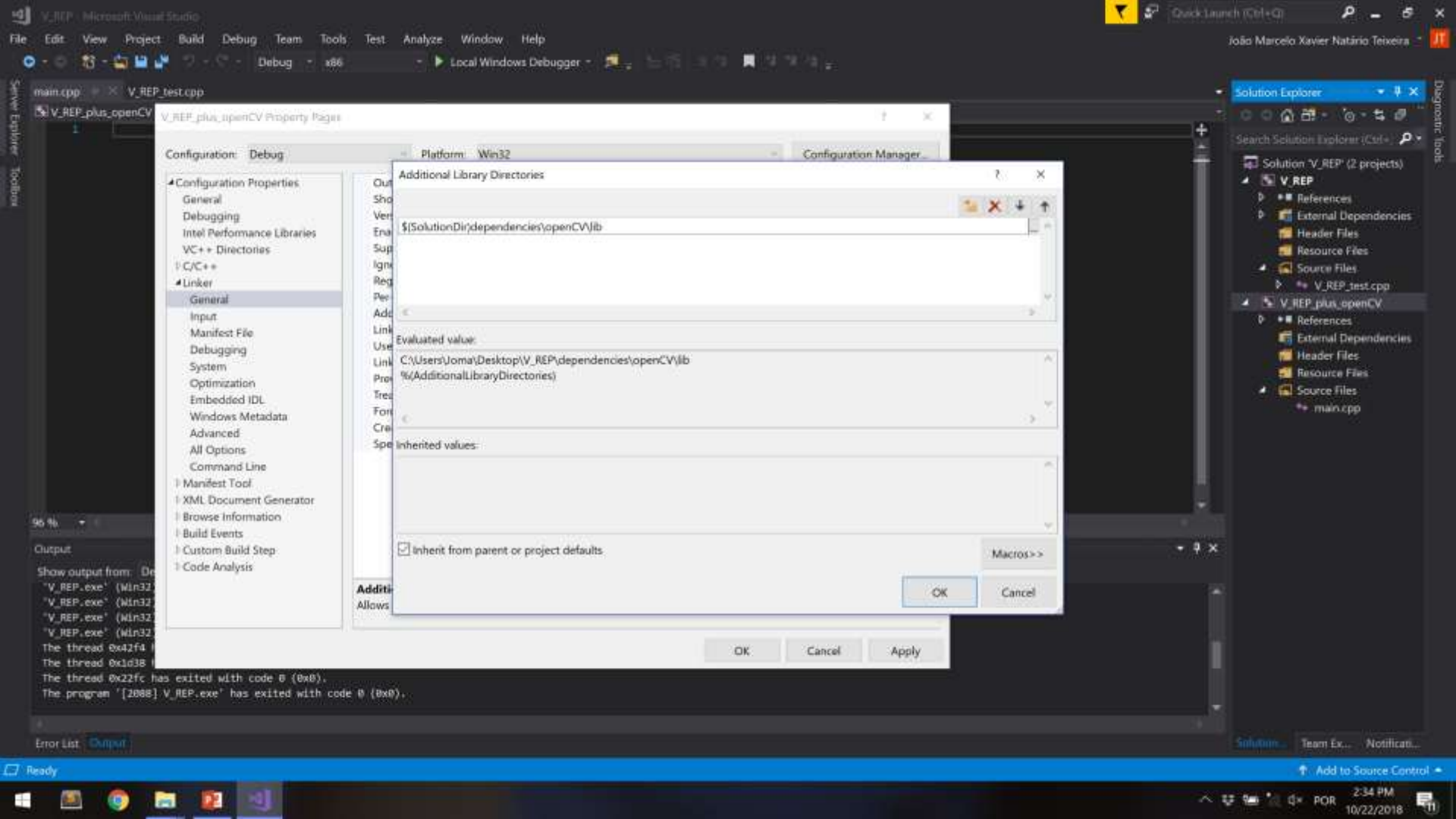


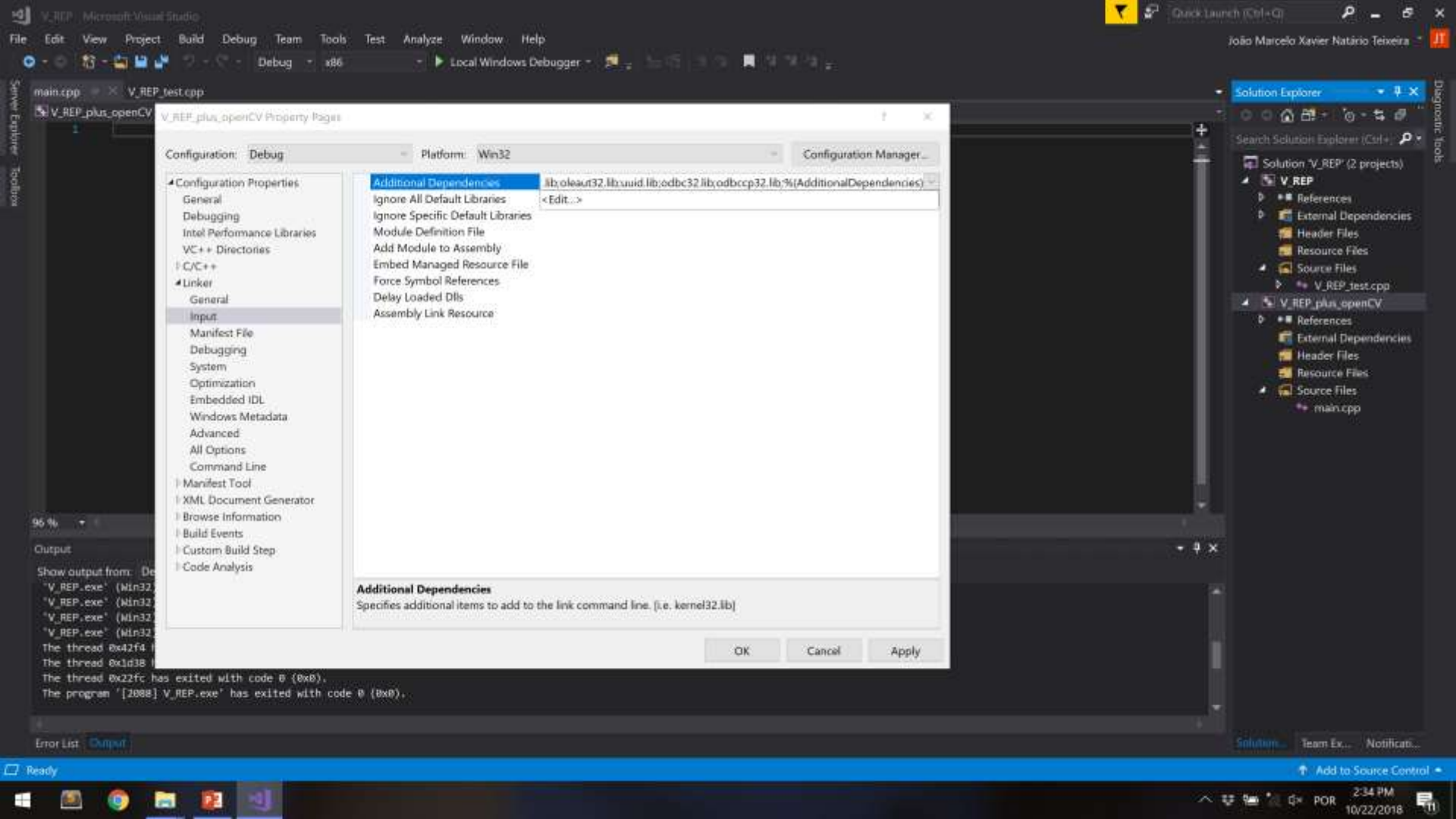

V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp V_REP_test.cpp
V_REP_plus_openCV (Global Scope)
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Build
Rebuild
Clean
View
Analyze
Project Only
Retarget Projects
Scope to This
New Solution Explorer View
Build Dependencies
Add
Class Wizard... Ctrl+Shift+X
Manage NuGet Packages...
Set as StartUp Project
Debug
Cut Ctrl+X
Paste Ctrl+V
Remove Del
Rename
Unload Project
Rescan Solution
Open Folder in File Explorer
Properties Alt+Enter
96 %
Output
Show output from: Debug
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sspicli.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\cryptbase.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\bcryptprimitives.dll'. Cannot find or open the PDB file.
'V_REP.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sechost.dll'. Cannot find or open the PDB file.
The thread 0x42f4 has exited with code 0 (0x0).
The thread 0x1d38 has exited with code 0 (0x0).
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Ready
Add to Source Control
POR 2:28 PM 10/22/2018

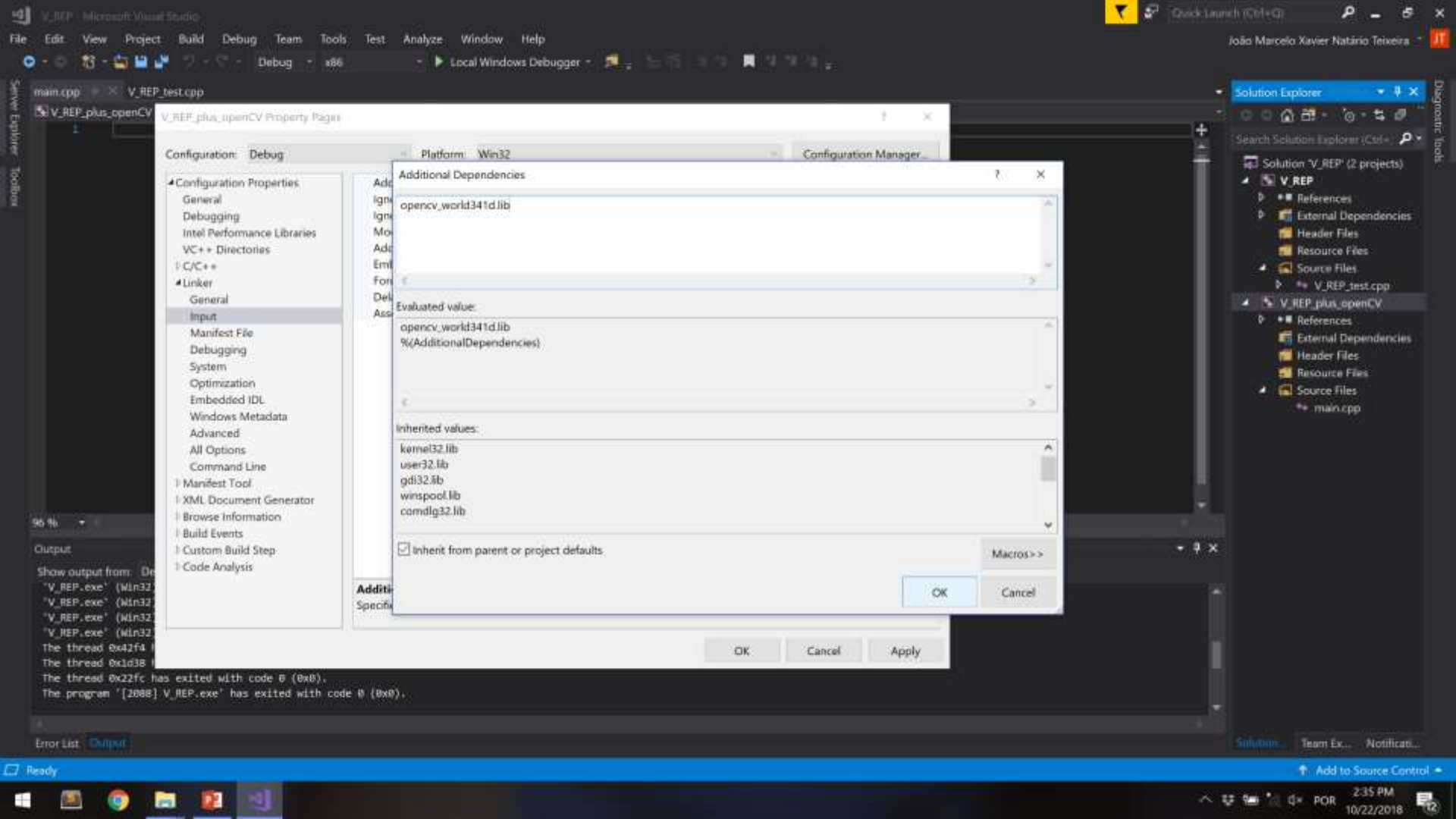

V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp V_REP_test.cpp
V_REP_plus_openCV
V_REP_plus_openCV Property Pages
Configuration: Debug
Platform: Win32
Configuration Manager...
Configuration Properties
General
Debugging
Intel Performance Libraries
VC++ Directories
C/C++
General
Optimization
Preprocessor
Code Generation
Language
Precompiled Headers
Output Files
Browse Information
Advanced
All Options
Command Line
Linker
Manifest Tool
XML Document Generator
Browse Information
Build Events
Custom Build Step
Code Analysis
Additional Include Directories
Additional #using Directories <Edit...>
Debug Information Format Program Database for Edit And Continue (/ZI)
Common Language RunTime Sup
Consume Windows Runtime Exte
Suppress Startup Banner Yes (/nologo)
Warning Level Level3 (/W3)
Treat Warnings As Errors No (/WX-)
Warning Version
Diagnostics Format Classic (/diagnostics:classic)
SDL checks Yes (/sdl)
Multi-processor Compilation
Additional Include Directories
Specifies one or more directories to add to the include path; separate with semi-colons if more than one. (/I[pa...
OK Cancel Apply
Solution Explorer
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Output
'V_REP.exe' (Win32)
'V_REP.exe' (Win32)
'V_REP.exe' (Win32)
'V_REP.exe' (Win32)
The thread 0x42f4
The thread 0x1d38
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Ready
Add to Source Control
POR 2:31 PM 10/22/2018

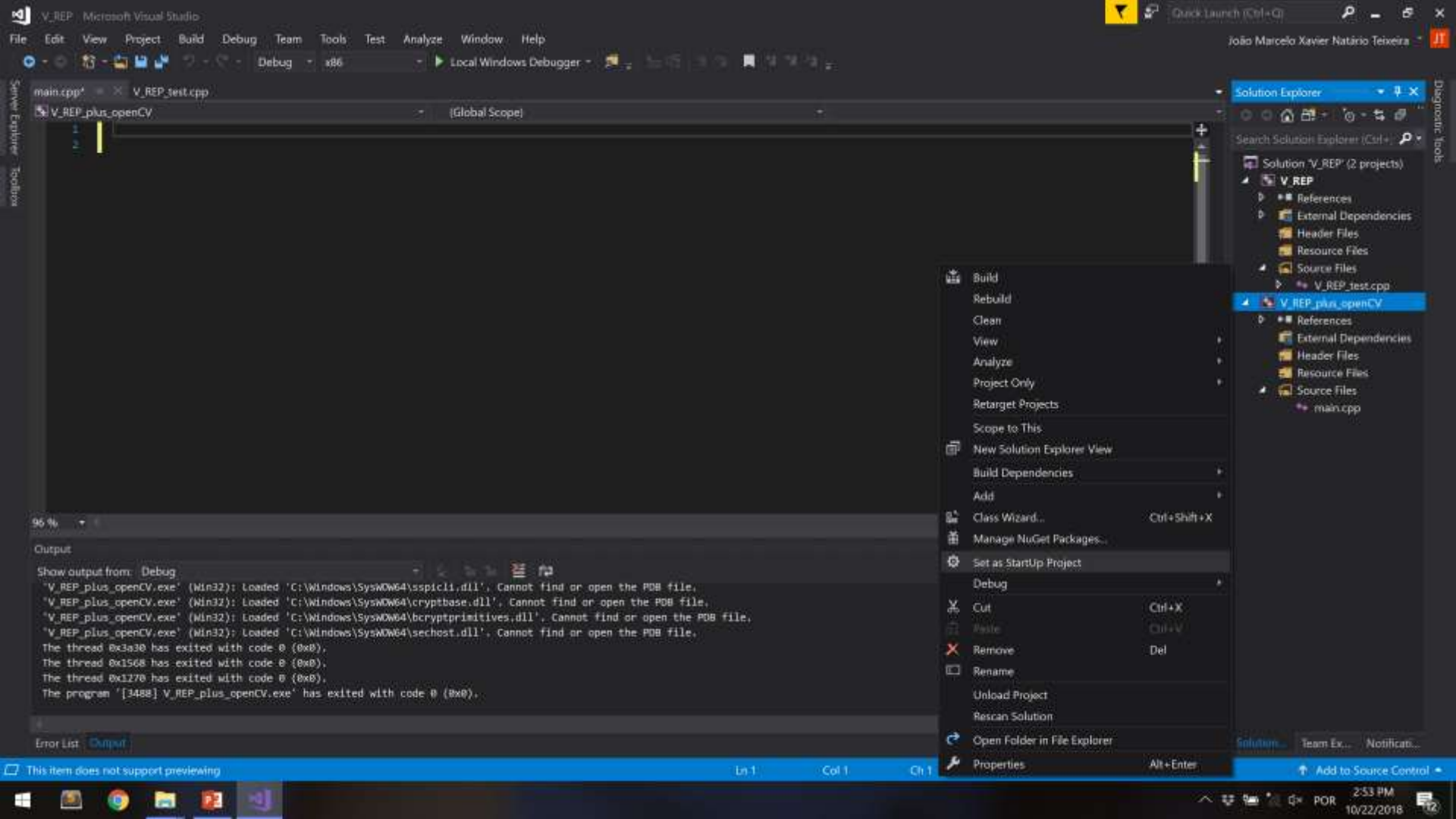

V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp V_REP_test.cpp
V_REP_plus_openCV
V_REP_plus_openCV Property Pages
Configuration: Debug
Platform: Win32
Configuration Manager...
Configuration Properties
General
Debugging
Intel Performance Libraries
VC++ Directories
C/C++
General
Optimization
Preprocessor
Code Generation
Language
Precompiled Headers
Output Files
Browse Information
Advanced
All Options
Command Line
Linker
Manifest Tool
XML Document Generator
Browse Information
Build Events
Custom Build Step
Code Analysis
Additional Include Directories
$(SolutionDir)dependencies\openCV\include
Evaluated value:
C:\Users\Joma\Desktop\V_REP\dependencies\openCV\include
%(AdditionalIncludeDirectories)
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel
OK
Cancel
Apply
Solution Explorer
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Output
Show output from: Debug
'V_REP.exe' (Win32)
'V_REP.exe' (Win32)
'V_REP.exe' (Win32)
'V_REP.exe' (Win32)
The thread 0x42f4
The thread 0x1d38
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Ready
Add to Source Control
POR 2:33 PM 10/22/2018


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp V_REP_test.cpp
V_REP_plus_openCV
V_REP_plus_openCV Property Pages
Configuration: Debug
Platform: Win32
Configuration Manager...
Configuration Properties
General
Debugging
Intel Performance Libraries
VC++ Directories
C/C++
Linker
General
Input
Manifest File
Debugging
System
Optimization
Embedded IDL
Windows Metadata
Advanced
All Options
Command Line
Manifest Tool
XML Document Generator
Browse Information
Build Events
Custom Build Step
Code Analysis
Output File $(OutDir)$(TargetName)$(TargetExt)
Show Progress Not Set
Version
Enable Incremental Linking Yes (/INCREMENTAL)
Suppress Startup Banner Yes (/NOLOGO)
Ignore Import Library No
Register Output No
Per-user Redirection No
Additional Library Directories
Link Library Dependencies <Edit...>
Use Library Dependency Inputs No
Link Status
Prevent Dll Binding
Treat Linker Warning As Errors
Force File Output
Create Hot Patchable Image
Specify Section Attributes
Additional Library Directories
Allows the user to override the environmental library path. (/LIBPATH:folder)
OK
Cancel
Apply
Solution Explorer
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Output
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Ready
Add to Source Control
POR 2:33 PM 10/22/2018

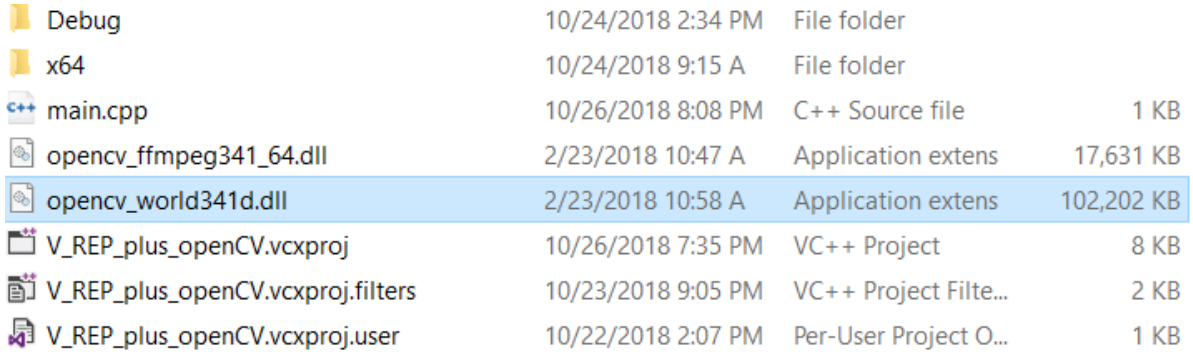

File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp V_REP_test.cpp
V_REP_plus_openCV
V_REP_plus_openCV Property Pages
Configuration: Debug
Platform: Win32
Configuration Manager...
Configuration Properties
General
Debugging
Intel Performance Libraries
VC++ Directories
C/C++
Linker
General
Input
Manifest File
Debugging
System
Optimization
Embedded IDL
Windows Metadata
Advanced
All Options
Command Line
Manifest Tool
XML Document Generator
Browse Information
Build Events
Custom Build Step
Code Analysis
Additional Library Directories
$(SolutionDir)dependencies\openCV\lib
Evaluated value:
C:\Users\Joma\Desktop\V_REP\dependencies\openCV\lib
%(AdditionalLibraryDirectories)
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel
OK
Cancel
Apply
Solution Explorer
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Output
'V_REP.exe' (Win32)
The thread 0x42f4
The thread 0x1d38
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Ready
Add to Source Control
POR
2:34 PM
10/22/2018


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp V_REP_test.cpp
V_REP_plus_openCV
V_REP_plus_openCV Property Pages
Configuration: Debug
Platform: Win32
Configuration Manager...
Configuration Properties
General
Debugging
Intel Performance Libraries
VC++ Directories
C/C++
Linker
General
Input
Manifest File
Debugging
System
Optimization
Embedded IDL
Windows Metadata
Advanced
All Options
Command Line
Manifest Tool
XML Document Generator
Browse Information
Build Events
Custom Build Step
Code Analysis
Additional Dependencies
Ignore All Default Libraries
Ignore Specific Default Libraries
Module Definition File
Add Module to Assembly
Embed Managed Resource File
Force Symbol References
Delay Loaded Dlls
Assembly Link Resource
lib;oleaut32.lib;uuid.lib;odbc32.lib;odbccp32.lib;%(AdditionalDependencies)
<Edit...>
Additional Dependencies
Specifies additional items to add to the link command line. [i.e. kernel32.lib]
OK
Cancel
Apply
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Output
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Ready
Add to Source Control
POR
2:34 PM
10/22/2018

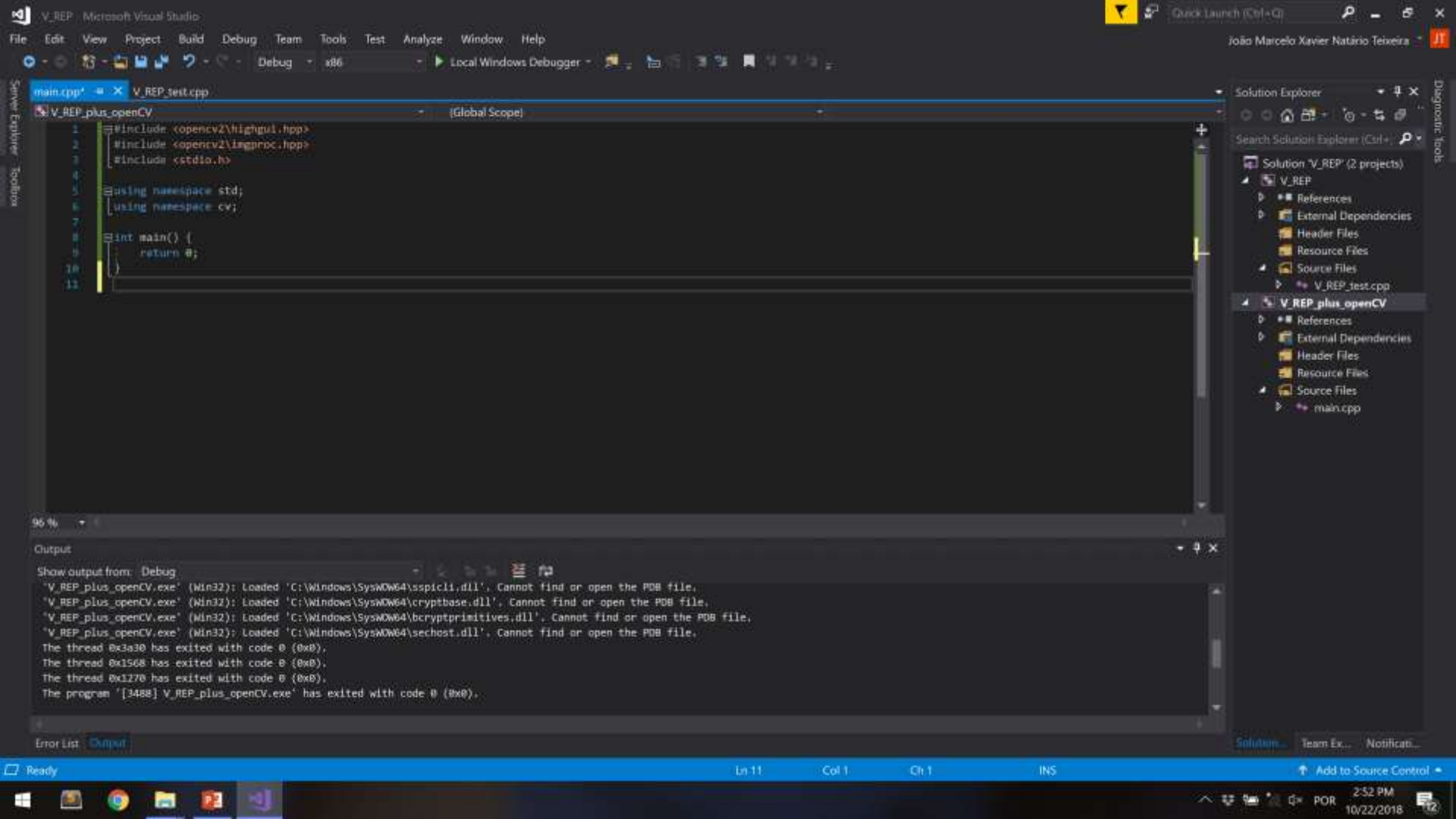

File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp V_REP_test.cpp
V_REP_plus_openCV
V_REP_plus_openCV Property Pages
Configuration: Debug
Platform: Win32
Configuration Manager...
Configuration Properties
General
Debugging
Intel Performance Libraries
VC++ Directories
C/C++
Linker
General
Input
Manifest File
Debugging
System
Optimization
Embedded IDL
Windows Metadata
Advanced
All Options
Command Line
Manifest Tool
XML Document Generator
Browse Information
Build Events
Custom Build Step
Code Analysis
Additional Dependencies
opencv_world341d.lib
Evaluated value:
opencv_world341d.lib
%(AdditionalDependencies)
Inherited values:
kernel32.lib
user32.lib
gdi32.lib
winspool.lib
comdlg32.lib
Inherit from parent or project defaults
Macros>>
OK
Cancel
OK
Cancel
Apply
Solution Explorer
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Output
'V_REP.exe' (Win32
'V_REP.exe' (Win32
'V_REP.exe' (Win32
'V_REP.exe' (Win32
The thread 0x42f4
The thread 0x1d38
The thread 0x22fc has exited with code 0 (0x0).
The program '[2088] V_REP.exe' has exited with code 0 (0x0).
Error List Output
Ready
Add to Source Control
POR
2:35 PM
10/22/2018


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp* V_REP_test.cpp
V_REP_plus_openCV (Global Scope)
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Build
Rebuild
Clean
View
Analyze
Project Only
Retarget Projects
Scope to This
New Solution Explorer View
Build Dependencies
Add
Class Wizard... Ctrl+Shift+X
Manage NuGet Packages...
Set as StartUp Project
Debug
Cut Ctrl+X
Paste Ctrl+V
Remove Del
Rename
Unload Project
Rescan Solution
Open Folder in File Explorer
Properties Alt+Enter
96 %
Output
Show output from: Debug
'V_REP_plus_openCV.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sspicli.dll'. Cannot find or open the PDB file.
'V_REP_plus_openCV.exe' (Win32): Loaded 'C:\Windows\SysWOW64\cryptbase.dll'. Cannot find or open the PDB file.
'V_REP_plus_openCV.exe' (Win32): Loaded 'C:\Windows\SysWOW64\bcryptprimitives.dll'. Cannot find or open the PDB file.
'V_REP_plus_openCV.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sechost.dll'. Cannot find or open the PDB file.
The thread 0x3a30 has exited with code 0 (0x0).
The thread 0x1568 has exited with code 0 (0x0).
The thread 0x1270 has exited with code 0 (0x0).
The program '[3488] V_REP_plus_openCV.exe' has exited with code 0 (0x0).
Error List Output
This item does not support previewing
Ln 1 Col 1 Ch 1
Add to Source Control
POR 2:53 PM 10/22/2018

OBS


Debug 10/24/2018 2:34 PM File folder
x64 10/24/2018 9:15 A File folder
main.cpp 10/26/2018 8:08 PM C++ Source file 1 KB
opencv_ffmpeg341_64.dll 2/23/2018 10:47 A Application extens 17,631 KB
opencv_world341d.dll 2/23/2018 10:58 A Application extens 102,202 KB
V_REP_plus_openCV.vcxproj 10/26/2018 7:35 PM VC++ Project 8 KB
V_REP_plus_openCV.vcxproj.filters 10/23/2018 9:05 PM VC++ Project Filte... 2 KB
V_REP_plus_openCV.vcxproj.user 10/22/2018 2:07 PM Per-User Project O... 1 KB

All right?!

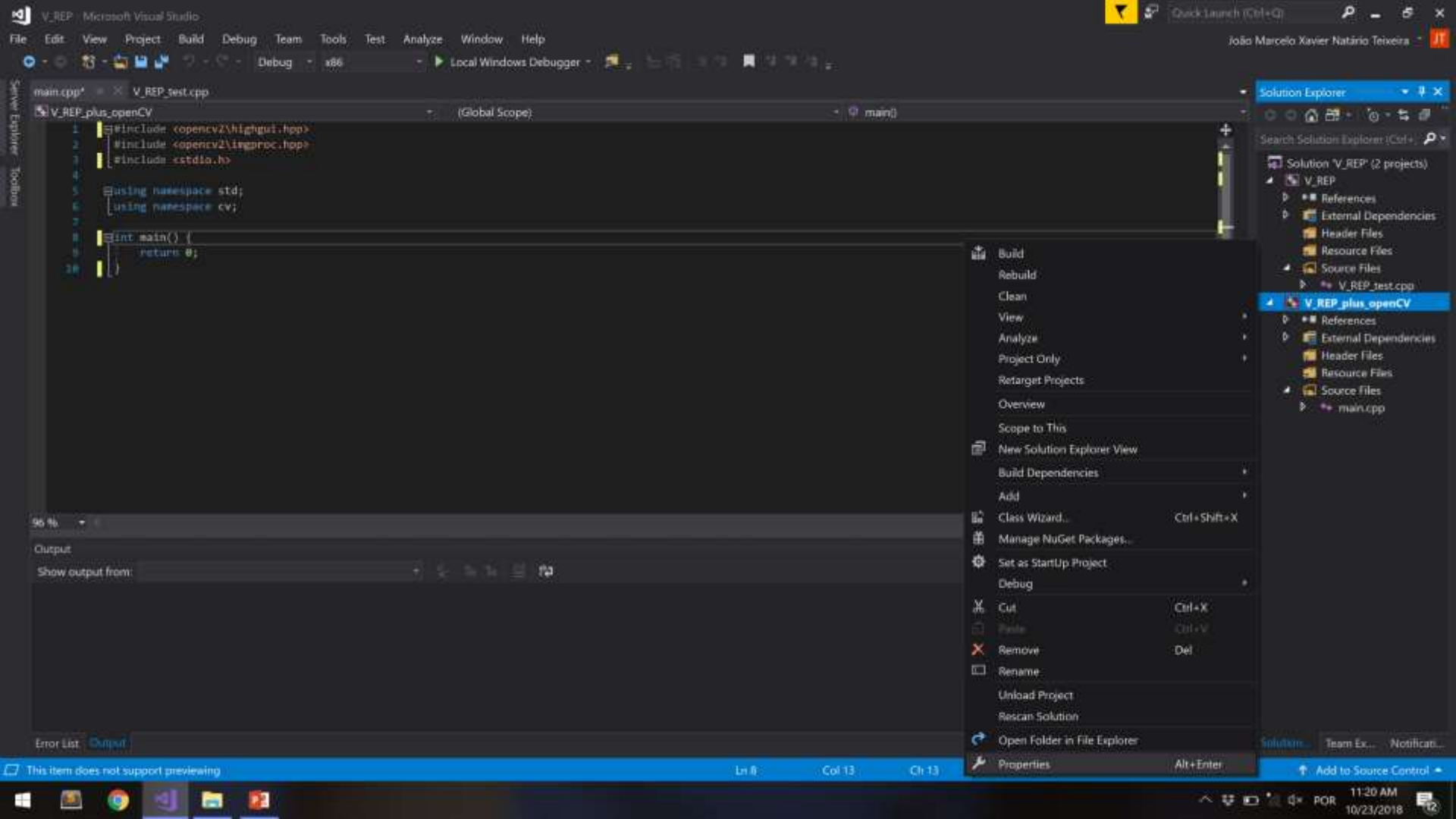

V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp* V_REP_test.cpp
V_REP_plus_openCV (Global Scope)
#include <opencv2\highgui.hpp>
#include <opencv2\imgproc.hpp>
#include <stdio.h>
using namespace std;
using namespace cv;
int main() {
return 0;
}
96 %
Output
Show output from: Debug
'V_REP_plus_openCV.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sspicli.dll'. Cannot find or open the PDB file.
'V_REP_plus_openCV.exe' (Win32): Loaded 'C:\Windows\SysWOW64\cryptbase.dll'. Cannot find or open the PDB file.
'V_REP_plus_openCV.exe' (Win32): Loaded 'C:\Windows\SysWOW64\bcryptprimitives.dll'. Cannot find or open the PDB file.
'V_REP_plus_openCV.exe' (Win32): Loaded 'C:\Windows\SysWOW64\sechost.dll'. Cannot find or open the PDB file.
The thread 0x3a30 has exited with code 0 (0x0).
The thread 0x1568 has exited with code 0 (0x0).
The thread 0x1270 has exited with code 0 (0x0).
The program '[3488] V_REP_plus_openCV.exe' has exited with code 0 (0x0).
Error List Output
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Ready
Ln 11 Col 1 Ch 1 INS
Add to Source Control
POR 2:52 PM 10/22/2018

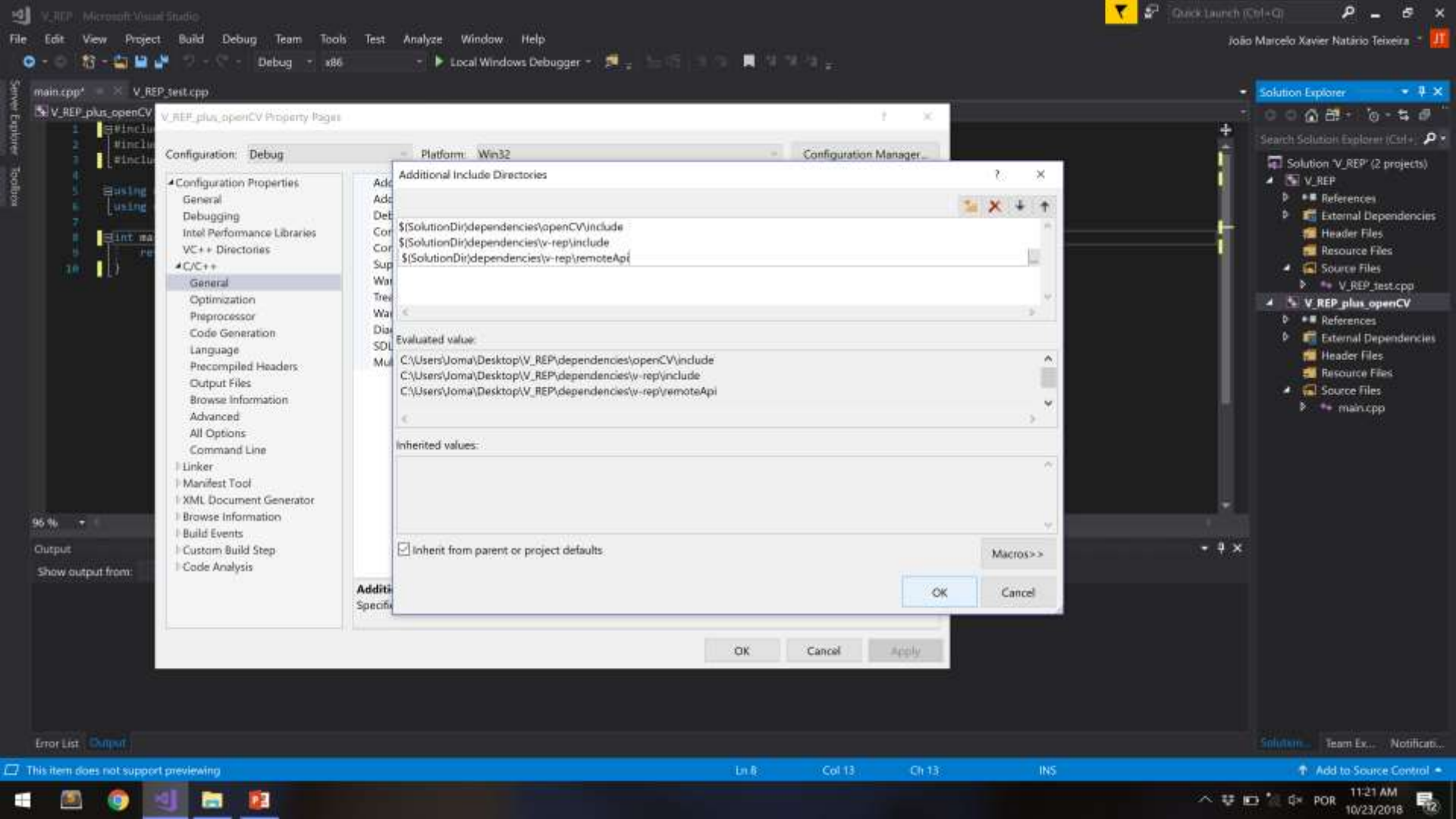
Practice 2: accessing the image through API

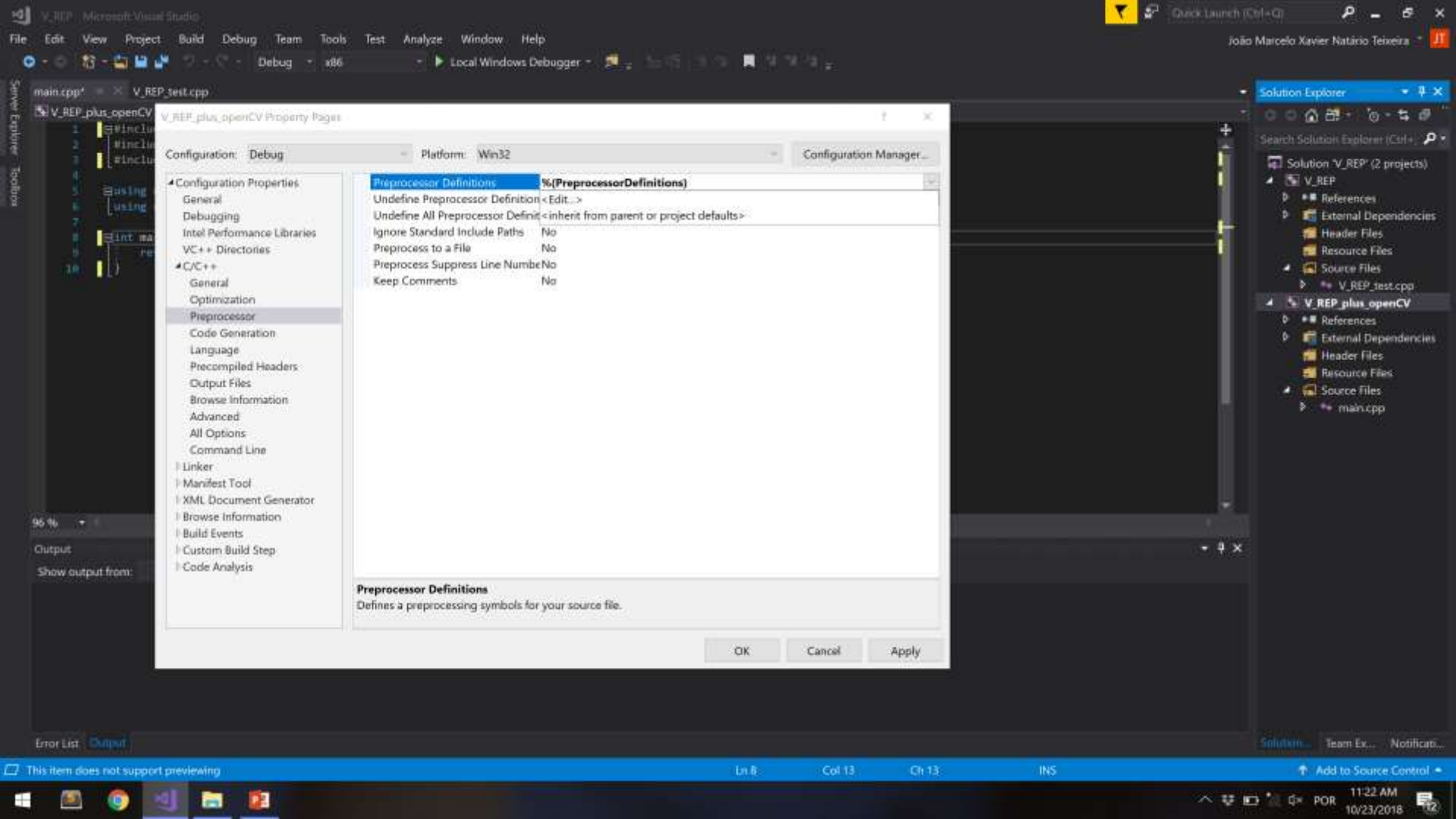
1º) integrate kinect to the scene and associate it with Pioneer

2º) configure visual studio with OpenCV and V-REP API

3º) access kinect image by external API


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp* V_REP_test.cpp
V_REP_plus_openCV (Global Scope) main()
#include <opencv2\highgui.hpp>
#include <opencv2\imgproc.hpp>
#include <stdio.h>
using namespace std;
using namespace cv;
int main() {
return 0;
}
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Build
Rebuild
Clean
View
Analyze
Project Only
Retarget Projects
Overview
Scope to This
New Solution Explorer View
Build Dependencies
Add
Class Wizard... Ctrl+Shift+X
Manage NuGet Packages...
Set as StartUp Project
Debug
Cut Ctrl+X
Paste Ctrl+V
Remove Del
Rename
Unload Project
Rescan Solution
Open Folder in File Explorer
Properties Alt+Enter
96 %
Output
Show output from:
Error List Output
This item does not support previewing
Ln 8 Col 13 Ch 13
Add to Source Control
POR 11:20 AM 10/23/2018


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp* V_REP_test.cpp
V_REP_plus_openCV
V_REP_plus_openCV Property Pages
Configuration: Debug
Platform: Win32
Configuration Manager...
Configuration Properties
General
Debugging
Intel Performance Libraries
VC++ Directories
C/C++
General
Optimization
Preprocessor
Code Generation
Language
Precompiled Headers
Output Files
Browse Information
Advanced
All Options
Command Line
Linker
Manifest Tool
XML Document Generator
Browse Information
Build Events
Custom Build Step
Code Analysis
Additional Include Directories
$(SolutionDir)dependencies\openCV\include
$(SolutionDir)dependencies\v-rep\include
$(SolutionDir)dependencies\v-rep\remoteApi
Evaluated value:
C:\Users\Joma\Desktop\V_REP\dependencies\openCV\include
C:\Users\Joma\Desktop\V_REP\dependencies\v-rep\include
C:\Users\Joma\Desktop\V_REP\dependencies\v-rep\remoteApi
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel
OK
Cancel
Apply
Solution Explorer
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
Header Files
Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
External Dependencies
Header Files
Resource Files
Source Files
main.cpp
Output
Error List
This item does not support previewing
Ln 8
Col 13
Ch 13
INS
Add to Source Control
POR
11:21 AM
10/23/2018


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp* V_REP_test.cpp
V_REP_plus_openCV
V_REP_plus_openCV Property Pages
Configuration: Debug
Platform: Win32
Configuration Manager...
Configuration Properties
General
Debugging
Intel Performance Libraries
VC++ Directories
C/C++
General
Optimization
Preprocessor
Code Generation
Language
Precompiled Headers
Output Files
Browse Information
Advanced
All Options
Command Line
Linker
Manifest Tool
XML Document Generator
Browse Information
Build Events
Custom Build Step
Code Analysis
Preprocessor Definitions %(PreprocessorDefinitions)
Undefine Preprocessor Definition <Edit...>
Undefine All Preprocessor Definit <inherit from parent or project defaults>
Ignore Standard Include Paths No
Preprocess to a File No
Preprocess Suppress Line Numbe No
Keep Comments No
Preprocessor Definitions
Defines a preprocessing symbols for your source file.
OK
Cancel
Apply
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
V_REP
References
External Dependencies
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Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
References
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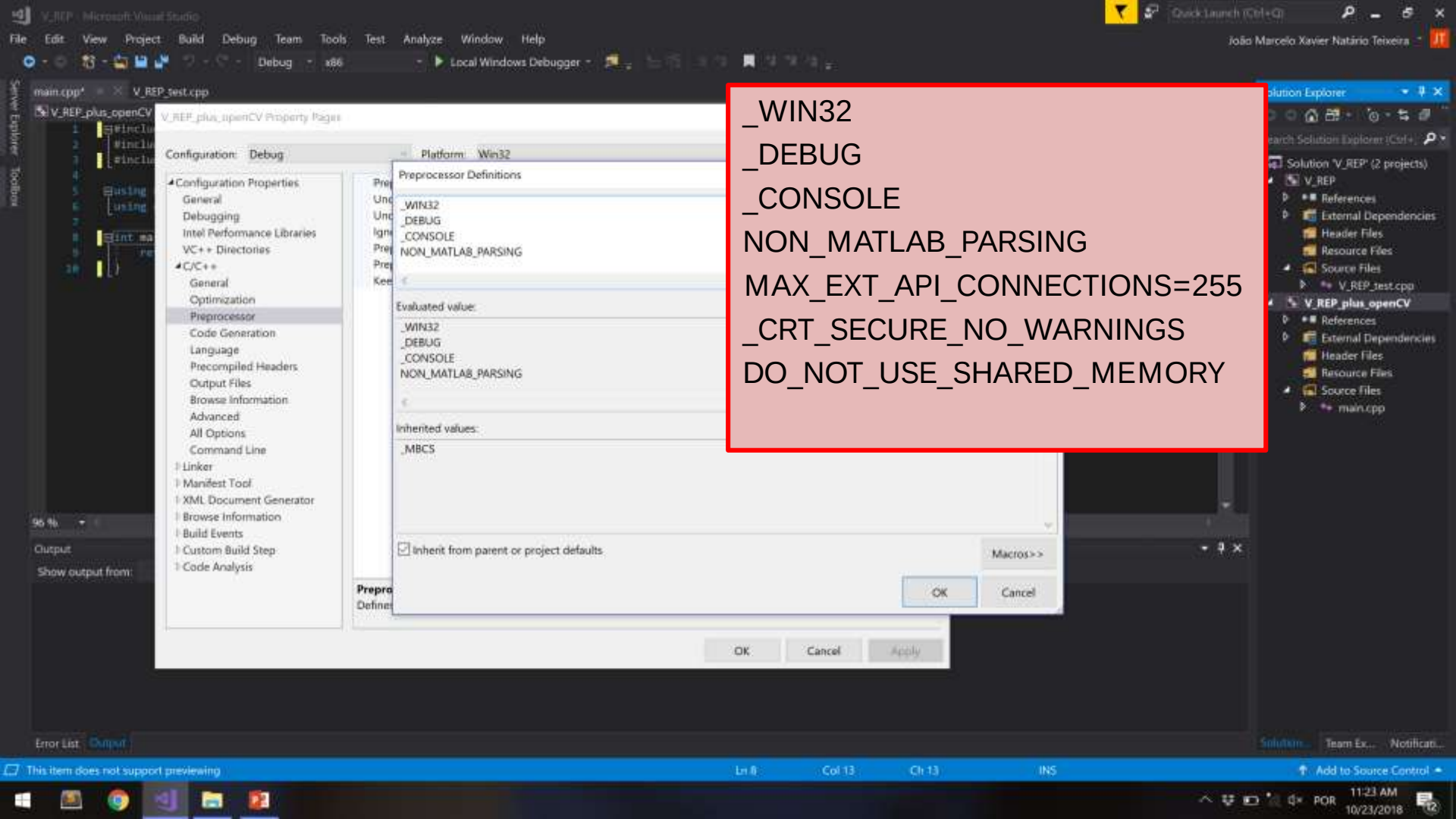
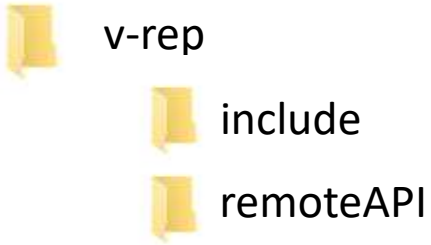
Resource Files
Source Files
main.cpp
Output
Show output from:
Error List Output
This item does not support previewing
Ln 8 Col 13 Ch 13 INS
Add to Source Control
POR 11:22 AM 10/23/2018


_WIN32
_DEBUG
_CONSOLE
NON_MATLAB_PARSING
MAX_EXT_API_CONNECTIONS=255
_CRT_SECURE_NO_WARNINGS
DO_NOT_USE_SHARED_MEMORY

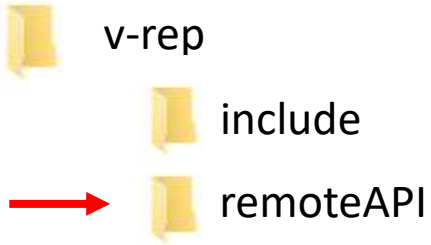
Practice 2: accessing the image through API

V-REP/dependencies/v-rep



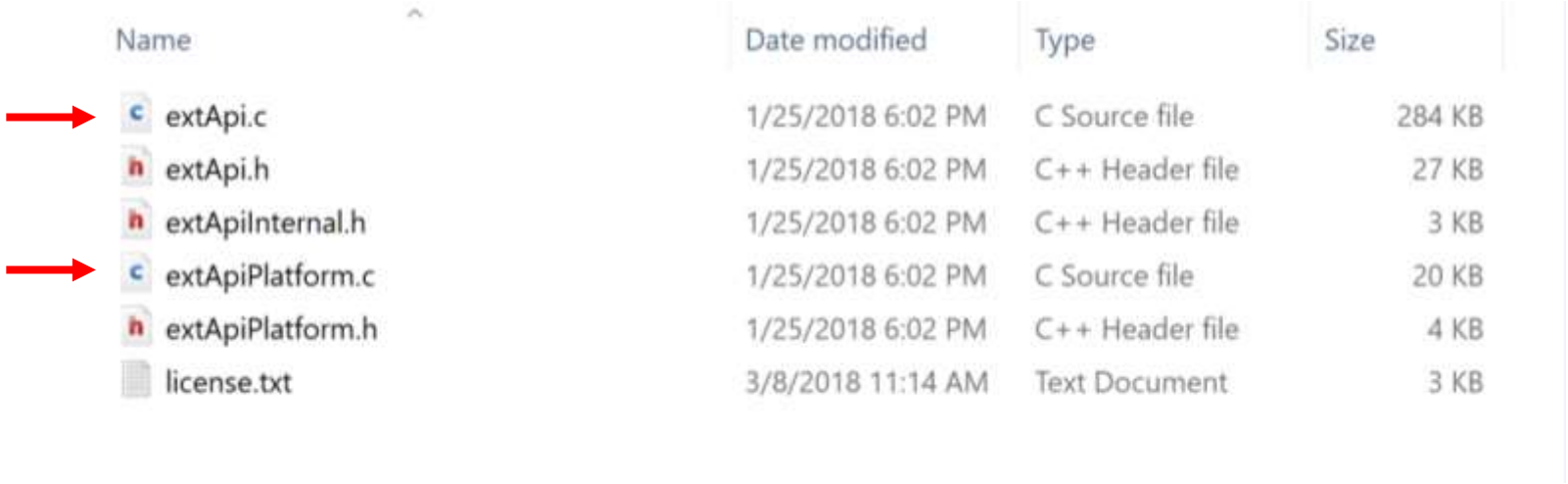
Practice 2: accessing the image through API

V-REP/dependencies/v-rep

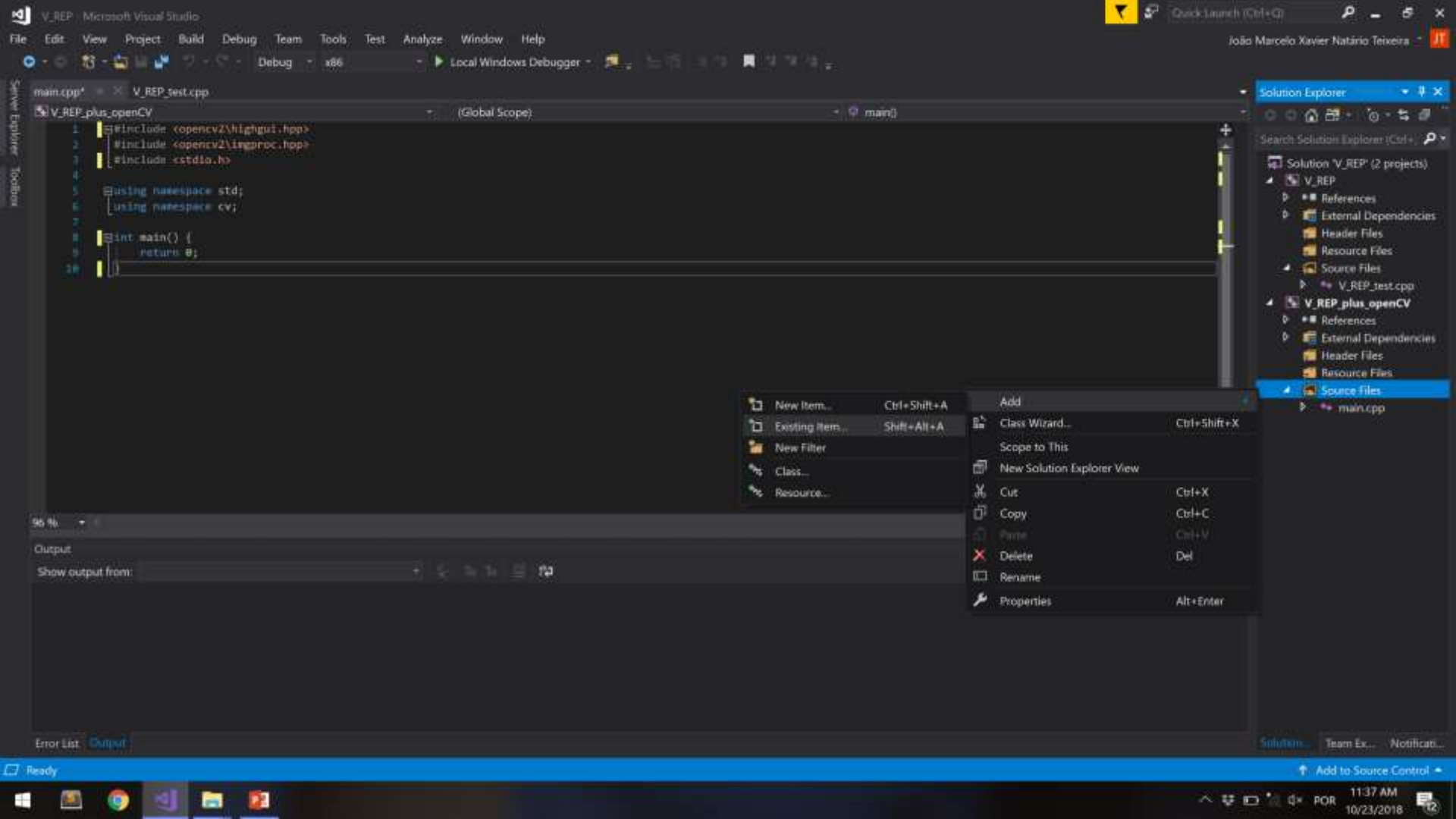


Practice 2: accessing the image through API

V-REP/dependencies/v-rep/remoteAPI



Name	Date modified	Type	Size
extApi.c	1/25/2018 6:02 PM	C Source file	284 KB
extApi.h	1/25/2018 6:02 PM	C++ Header file	27 KB
extApiInternal.h	1/25/2018 6:02 PM	C++ Header file	3 KB
extApiPlatform.c	1/25/2018 6:02 PM	C Source file	20 KB
extApiPlatform.h	1/25/2018 6:02 PM	C++ Header file	4 KB
license.txt	3/8/2018 11:14 AM	Text Document	3 KB


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp* V_REP_test.cpp
V_REP_plus_openCV (Global Scope) main()
#include <opencv2\highgui.hpp>
#include <opencv2\imgproc.hpp>
#include <stdio.h>
using namespace std;
using namespace cv;
int main() {
return 0;
}
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
V_REP
References
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Resource Files
Source Files
V_REP_test.cpp
V_REP_plus_openCV
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Source Files
main.cpp
New Item... Ctrl+Shift+A
Existing Item... Shift+Alt+A
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Resource...
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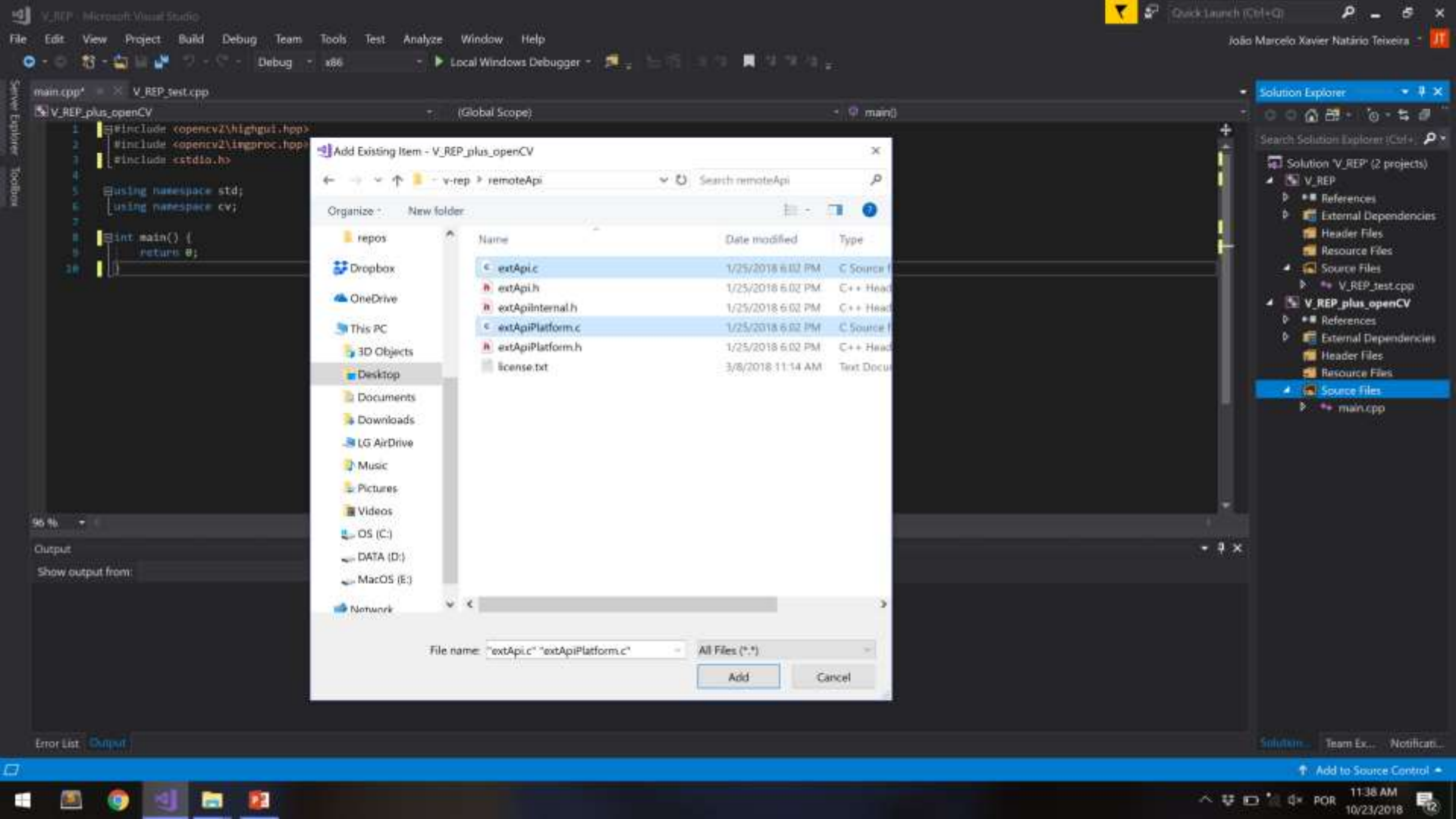
V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp* V_REP_test.cpp
V_REP_plus_openCV (Global Scope) main()
#include <opencv2\highgui.hpp>
#include <opencv2\imgproc.hpp>
#include <cstdio.h>
using namespace std;
using namespace cv;
int main() {
return 0;
}
Add Existing Item - V_REP_plus_openCV
v-rep > remoteApi
Search remoteApi
Organize New folder
repos
Dropbox
OneDrive
This PC
3D Objects
Desktop
Documents
Downloads
LG AirDrive
Music
Pictures
Videos
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DATA (D:)
MacOS (E:)
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license.txt 3/8/2018 11:14 AM Text Docu
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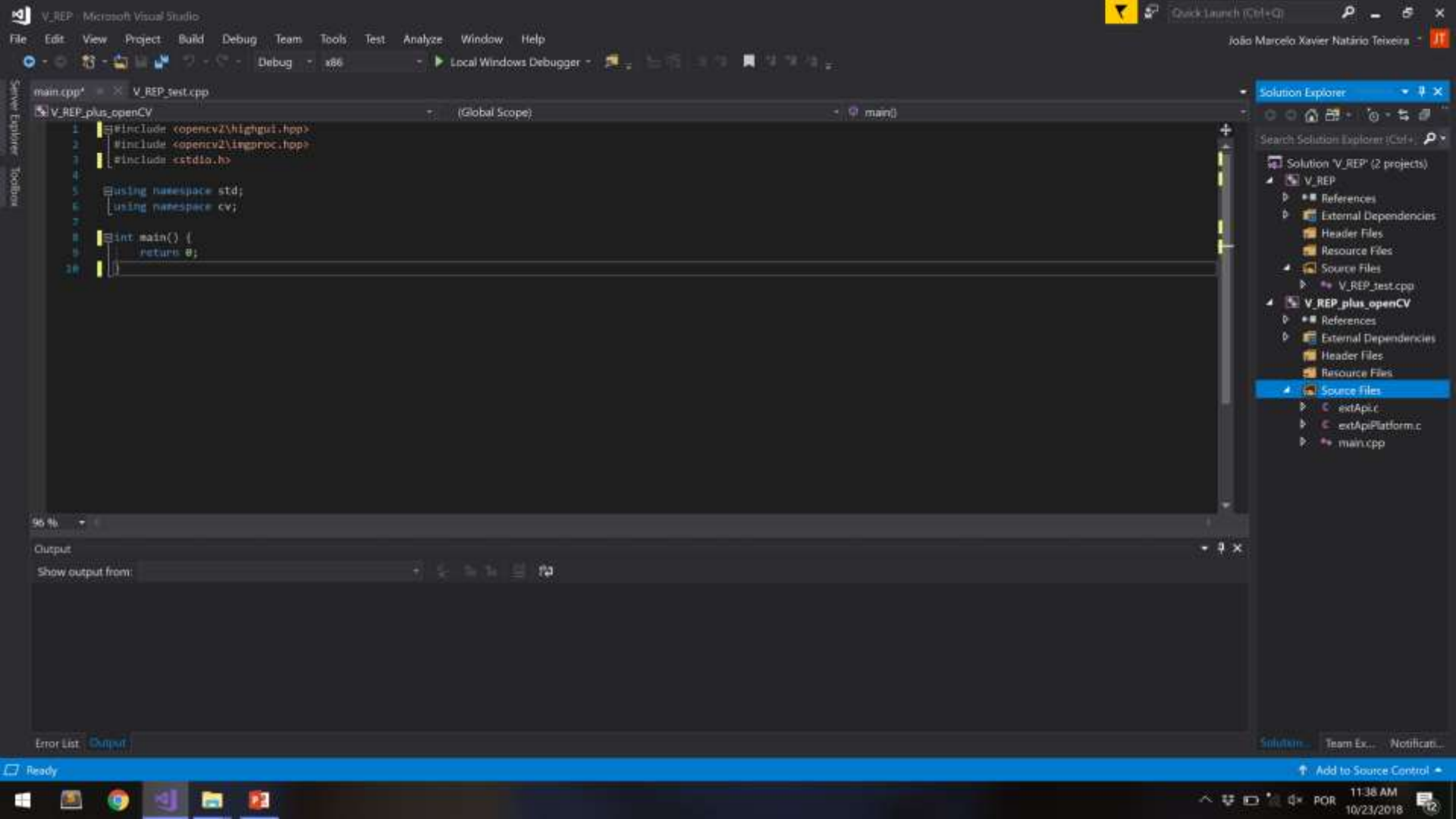
V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp* V_REP_test.cpp
V_REP_plus_openCV (Global Scope) main()
#include <opencv2\highgui.hpp>
#include <opencv2\imgproc.hpp>
#include <stdio.h>
using namespace std;
using namespace cv;
int main() {
return 0;
}
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Source Files
extApi.c
extApiPlatform.c
main.cpp
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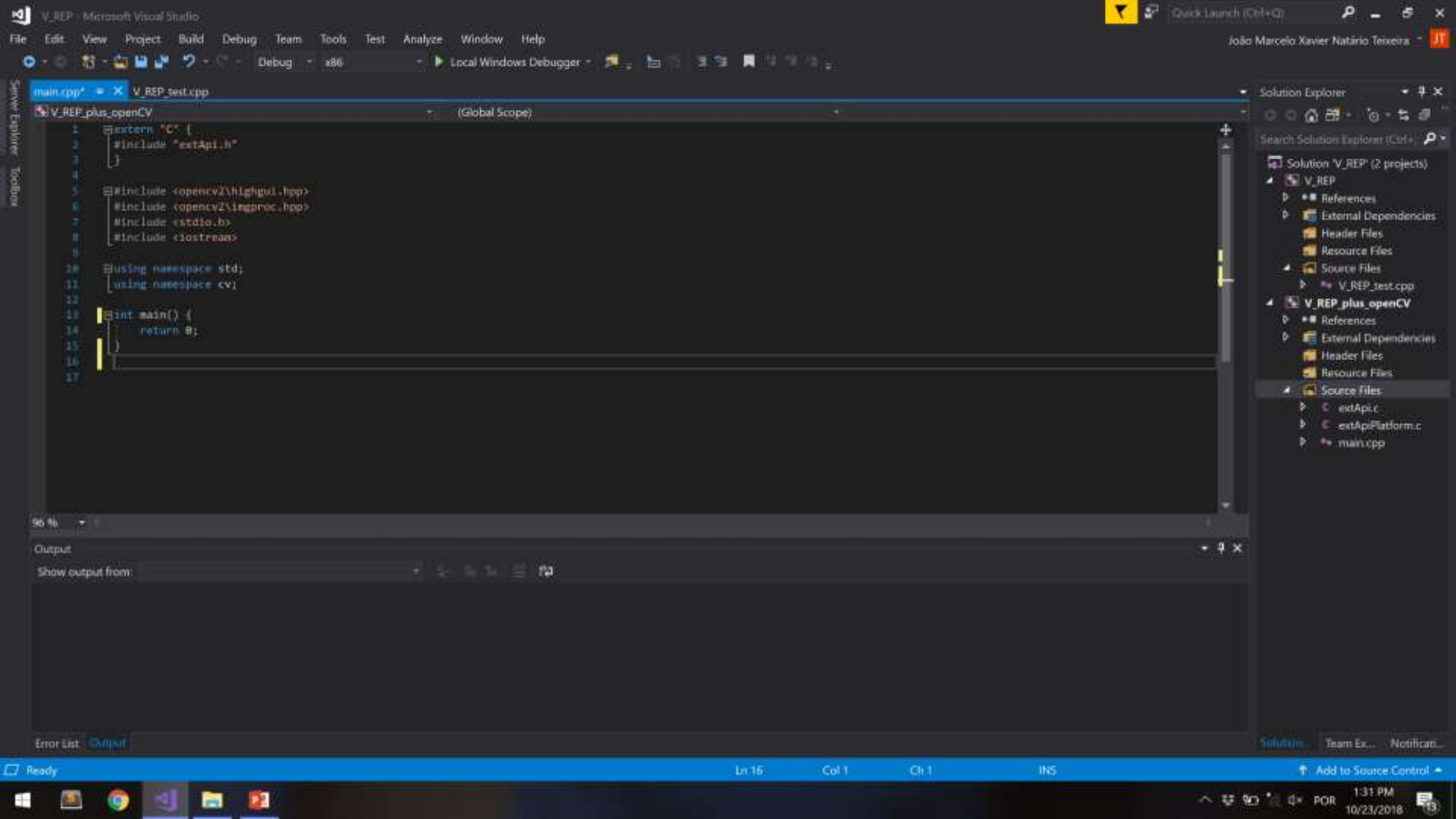
All right?!


V_REP - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
Debug x86 Local Windows Debugger
main.cpp* V_REP_test.cpp
V_REP_plus_openCV (Global Scope)
extern "C" {
#include "extApi.h"
}
#include <opencv2\highgui.hpp>
#include <opencv2\imgproc.hpp>
#include <stdio.h>
#include <iostream>
using namespace std;
using namespace cv;
int main() {
return 0;
}
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Error List Output
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'V_REP' (2 projects)
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Header Files
Resource Files
Source Files
extApi.c
extApiPlatform.c
main.cpp
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10/23/2018

Practice 2: accessing the image through API

1º) integrate kinect to the scene and associate it with Pioneer

2º) configure visual studio with OpenCV and V-REP API

3º) access kinect image by external API

Practice 2: accessing the image through API

Embedded script - kinect

```
function sysCall_init()
    depthCam=sim.getObjectHandle('kinect_depth')
    depthView=sim.floatingViewAdd(0.9,0.9,0.2,0.2,0)
    sim.adjustView(depthView,depthCam,64)

    colorCam=sim.getObjectHandle('kinect_rgb')
    colorView=sim.floatingViewAdd(0.69,0.9,0.2,0.2,0)
    sim.adjustView(colorView,colorCam,64)
end
```

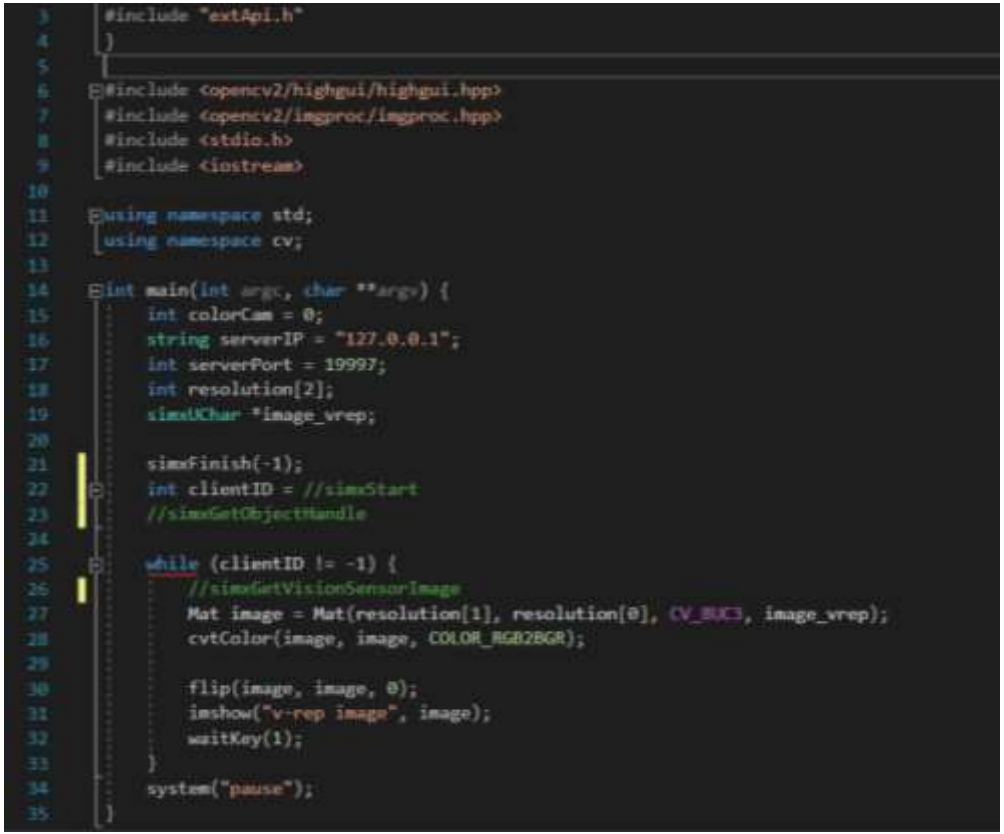
Help links

- **V-REP manual:**

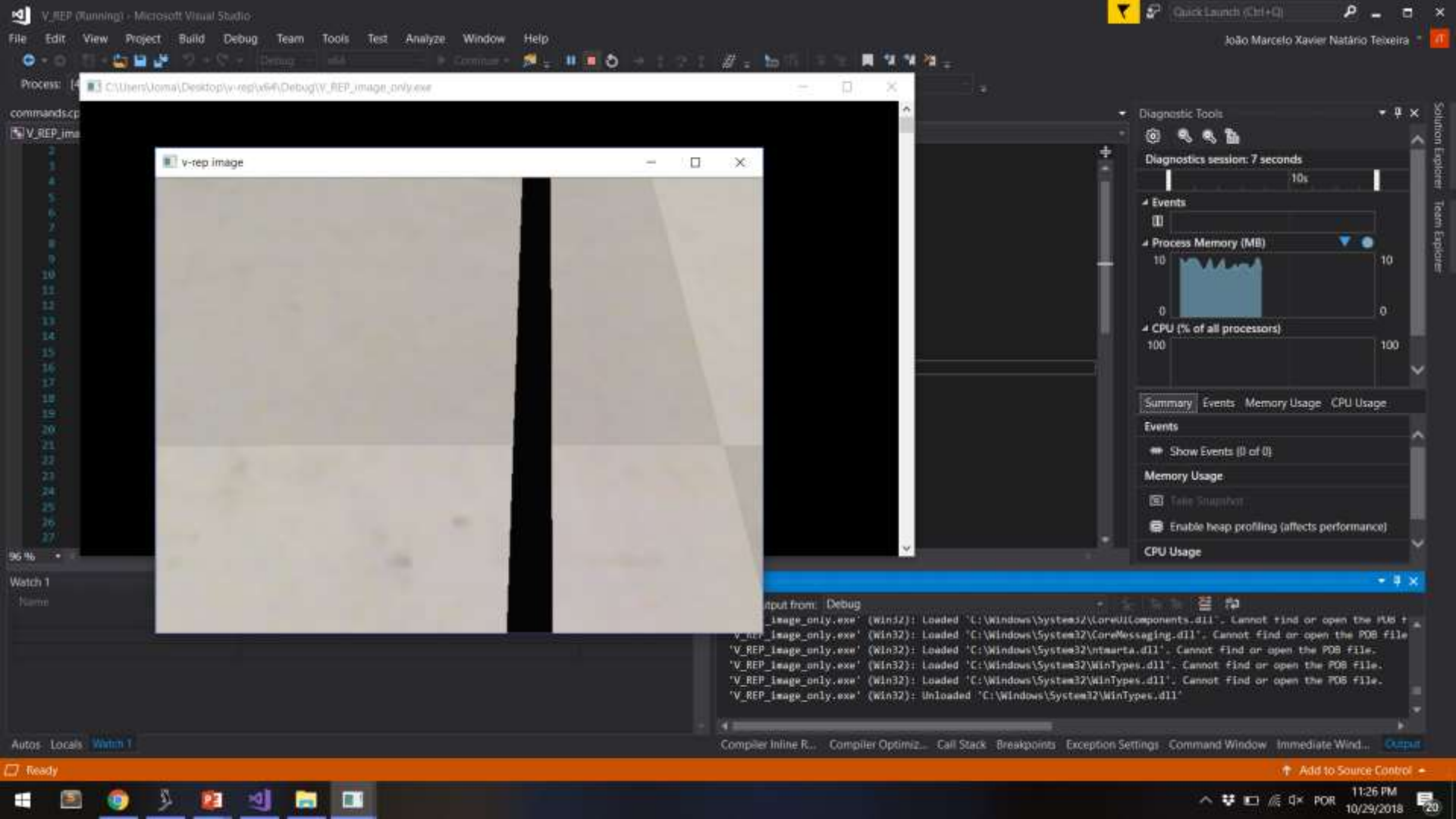
http://www.coppeliarobotics.com/helpFiles/

- **Remote API functions (C/C++):**

http://www.coppeliarobotics.com/helpFiles/en/remoteApiFunctions.htm



```
#include "extApi.h"
}
{
#include <opencv2/highgui/highgui.hpp>
#include <opencv2/imgproc/imgproc.hpp>
#include <stdio.h>
#include <iostream>

using namespace std;
using namespace cv;

int main(int argc, char **argv) {
    int colorCam = 0;
    string serverIP = "127.0.0.1";
    int serverPort = 19997;
    int resolution[2];
    simxUChar *image_vrep;

    simxFinish(-1);
    int clientID = //simxStart
    //simxGetObjectHandle

    while (clientID != -1) {
        //simxGetVisionSensorImage
        Mat image = Mat(resolution[1], resolution[0], CV_8UC3, image_vrep);
        cvtColor(image, image, COLOR_RGB2BGR);

        flip(image, image, 0);
        imshow("v-rep image", image);
        waitKey(1);
    }
    system("pause");
}
```


V_REP (Running) - Microsoft Visual Studio
File Edit View Project Build Debug Team Tools Test Analyze Window Help
João Marcelo Xavier Natário Teixeira
C:\Users\Joma\Desktop\v-rep\x64\Debug\V_REP_image_only.exe
v-rep image
Diagnostic Tools
Diagnostics session: 7 seconds
10s
Events
Process Memory (MB)
CPU (% of all processors)
Summary Events Memory Usage CPU Usage
Show Events (0 of 0)
Memory Usage
Enable heap profiling (affects performance)
CPU Usage
Watch 1
Output from: Debug
'V_REP_image_only.exe' (Win32): Loaded 'C:\Windows\System32\CoreMessaging.dll'. Cannot find or open the PDB file
'V_REP_image_only.exe' (Win32): Loaded 'C:\Windows\System32\ntmarta.dll'. Cannot find or open the PDB file.
'V_REP_image_only.exe' (Win32): Loaded 'C:\Windows\System32\WinTypes.dll'. Cannot find or open the PDB file.
'V_REP_image_only.exe' (Win32): Loaded 'C:\Windows\System32\WinTypes.dll'. Cannot find or open the PDB file.
'V_REP_image_only.exe' (Win32): Unloaded 'C:\Windows\System32\WinTypes.dll'
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Practice 3: line follower robot

1º) create new project in VS

2º) configure Visual Studio with OpenCV and V-REP API

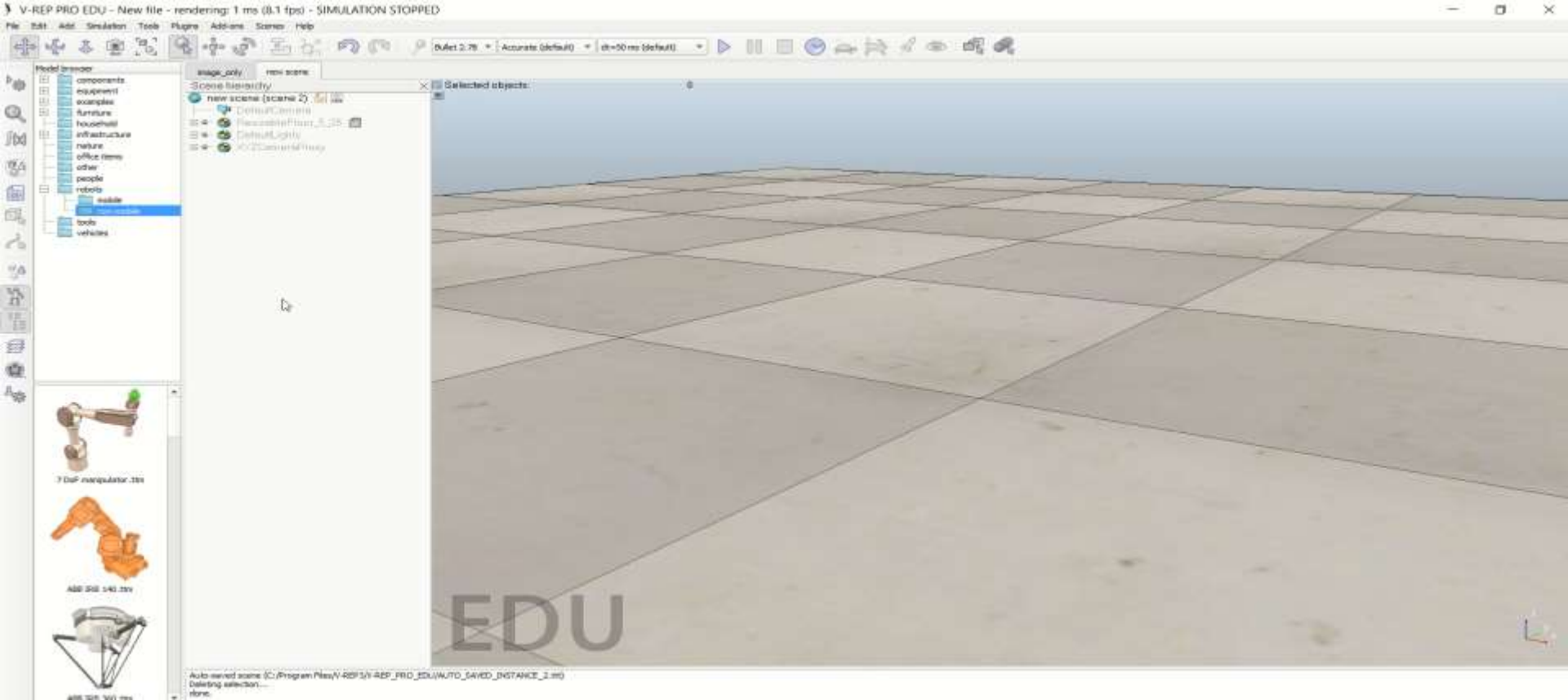
3º) access kinect image by external API

4º) in V-REP add a path to follow

5º) Is the path visible by the vision sensor? If yes, follow the line!

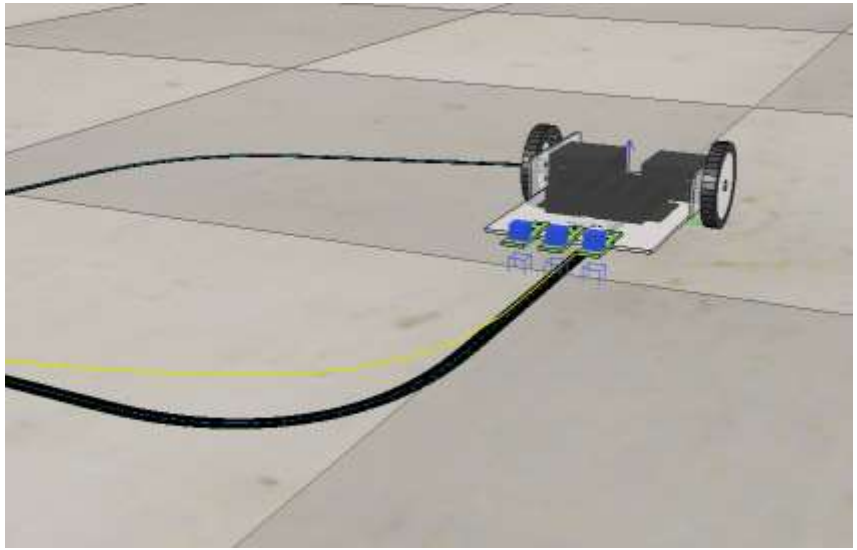
Practice 3: line follower robot

- **Drawing the path:**



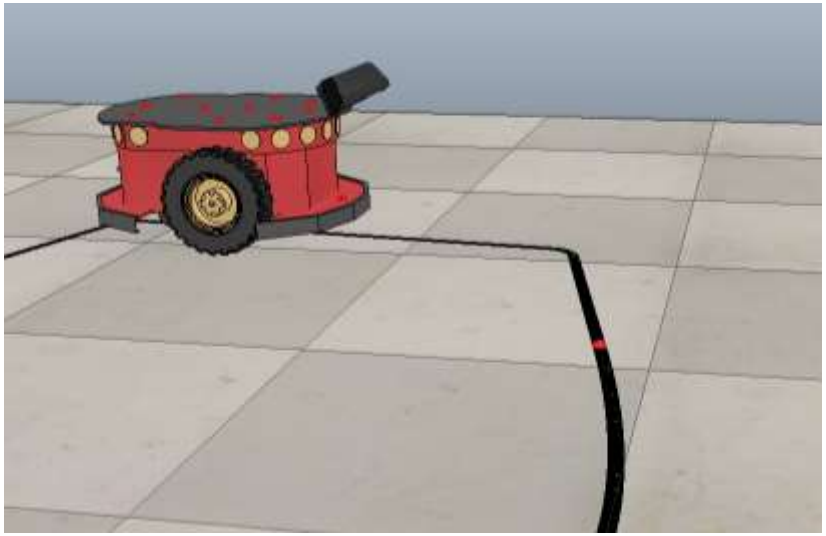
Practice 3: line follower robot

- **Test your path:**



Practice 3: line follower robot

- **Goes back to the Pioneer Robot with a kinect camera:**



Practice 3: line follower robot

- **Remember:**
- **Kinect ->**

```
function sysCall_init()
    depthCam=sim.getObjectHandle('kinect_depth')
    depthView=sim.floatingViewAdd(0.9,0.9,0.2,0.2,0)
    sim.adjustView(depthView,depthCam,64)

    colorCam=sim.getObjectHandle('kinect_rgb')
    colorView=sim.floatingViewAdd(0.69,0.9,0.2,0.2,0)
    sim.adjustView(colorView,colorCam,64)
end
```

- **Pioneer ->**

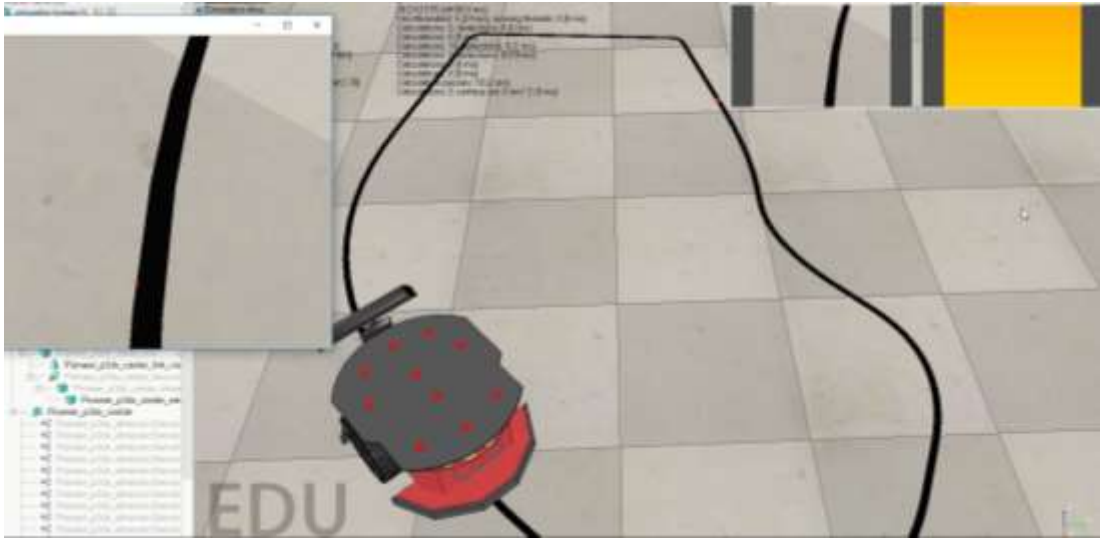
```
function sysCall_init()
    motorLeft=sim.getObjectHandle("Pioneer_p3dx_leftMotor")
    motorRight=sim.getObjectHandle("Pioneer_p3dx_rightMotor")
    vLeft =0;
    vRight=0;
    sim.setJointTargetVelocity(motorLeft,vLeft)
    sim.setJointTargetVelocity(motorRight,vRight)
end
```

Practice 3: line follower robot

- **Going to Visual Studio**

Practice 3: line follower robot

- **Output**



Practice 4: controlling Pionner Robot through keyboard

1º) create new project in VS

2º) configure Visual Studio with OpenCV and V-REP API

3º) access kinect image by external API

4º) code the Pioneer to read commands send by VS

5º) code VS to send commands

6º) control the Pionner through the keyboard, where "w" goes forward, "s" goes back, "d" goes to the right and "a" goes to the left

Practice 4: controlling Pionner Robot through keyboard

Embedded script

```
function sysCall_init()
    leftMotor=sim.getObjectHandle("Pioneer_p3dx_leftMotor")
    rightMotor=sim.getObjectHandle("Pioneer_p3dx_rightMotor")
    leftSpeed = 0
    rightSpeed = 0
    speed = 2
end
function sysCall_actuation()

    signalValue=sim.getIntegerSignal("command")
    print(signalValue)
        if (signalValue==2018) then
            leftSpeed = -speed;
            rightSpeed = -speed;
        elseif (signalValue==2019) then
            leftSpeed = speed;
            rightSpeed = speed;
        elseif (signalValue==2020) then
            leftSpeed = -speed;
            rightSpeed = speed;
        elseif (signalValue==2021) then
            leftSpeed = speed;
            rightSpeed = -speed;
        else
            leftSpeed = 0;
            rightSpeed = 0;
        end
    sim.setJointTargetVelocity(leftMotor,leftSpeed)
    sim.setJointTargetVelocity(rightMotor,rightSpeed)
end
```

Practice 4: controlling Pionner Robot through keyboard

- **Going to Visual Studio**

Helpful links

- **V-REP manual:**

http://www.coppeliarobotics.com/helpFiles/

- **Remote API functions (C/C++):**

http://www.coppeliarobotics.com/helpFiles/en/remoteApiFunctions.htm