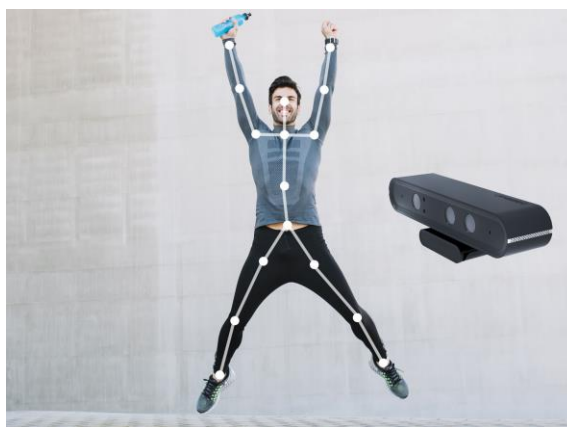




Body Tracking with Orbbec ASTRA PRO



Integration of a full body tracking system into in-lab developed postural rehabilitation exer-games using the [Orbbec ASTRA](#) RGB-D Camera API using the [Unity](#) Game Engine.



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Body Tracking with Openpose



Optimization of a full body tracking system based on [Openpose](#) to allow it to be used in real-time in the [Unity](#) Game Engine, system will be integrated with in-lab developed postural rehabilitation exer-games.



OpenPose

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Procedural Generation of Video Games Enrichments



Usage of procedural content generation to generate enrichments (forests, flocks of birds, procedural animations, particle or sound effects ...) for in-lab developed exergames to increase user immersion and engagement.

The project may consists in developing an asset (or a set of assets) for the [Unity](#) Game Engine.



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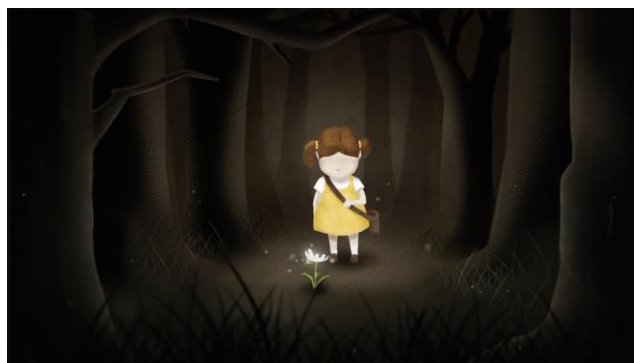
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Automatic story narration in [Unity](#)



Starting from the output of an in-lab developed story generator, procedurally generate text, art and animations that map story sequences into simple animated scenes used to narrate story events to the final user.



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Design and development of a 3D-printed brush robots



- designing a “bristlebot” or “brushbot” and 3d-print it.

and one or more of the following:

- write a simple control system for the brushbot to be able to drive them remotely.
- A/R based robot localization using 2d markers with Vuforia (and or Microsoft Hololens). Localization may be used to make robot automatically reach a target using a fuzzy control system.
- A/R based robot localization using 2d markers with Vuforia (and/or Microsoft Hololens). Localization may be used to make robot automatically reach a target using RL with the Unity ML-Agents package.



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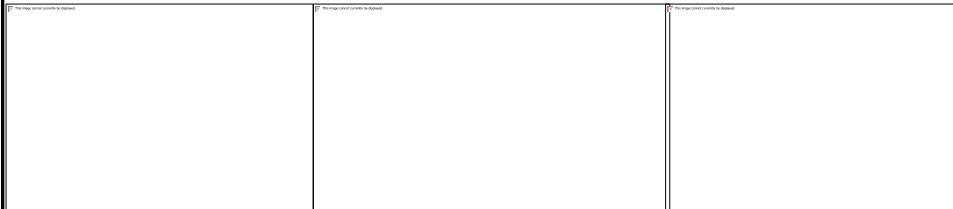
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Robot Teleop based on augmented reality




Integration of a ROS-based existing robot with an Augmented Reality application using Microsoft Hololens in order to provide a mechanism for teleoperating a robot in Augmented Reality using the robot camera and the map of the environment




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Multirobot exploration




Development of a web-application for controlling with a dashboard a team of robots exploring an unknown environment.


Data perceived by the robot (map and camera stream) should be sent through the web application.

The user should be able to supervise the team of robot and send high-level commands to the robots.

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UN-Trapped robot



Autonomous mobile robots have have the bad habit of getting stuck while doing their task.

This can happen for numerous reason, like trying to pass through a narrow passage or crashing into something.

We want to provide a set of recovery behaviours (i.e. actions that the robot can perform in order to un-stuck itself, like rotating or going backwards) using Deep Reinforcement Learning.

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Autonomous Navigation

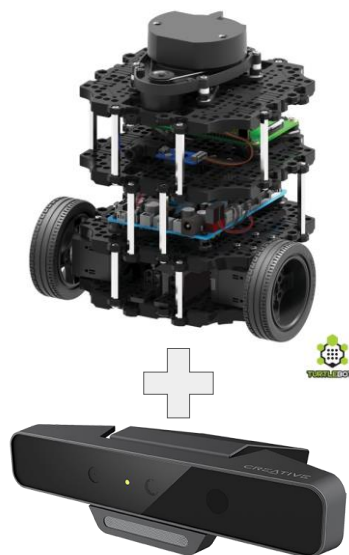


Upgrade of a Turtlebot 3 laser-based autonomous mobile robot with a:

- PI-cam
- Intel Realsense RGBD camera or Orbecc Astra PRO RGBD camera

In order to enhance its obstacle avoidance and path planning abilities.

Integration of pre-trained DNN for object recognition and semantic mapping into the Turtlebot3 framework.



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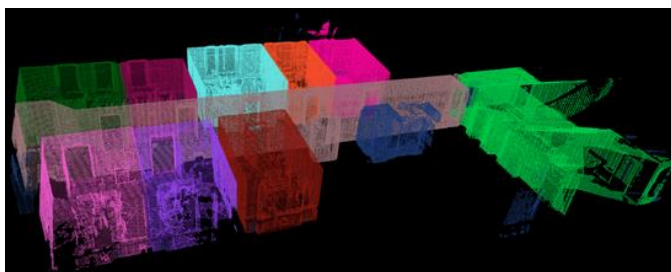
Map Segmentation



Map segmentation is the task of retrieving the shape and position of different rooms from a 2D or 3D metric map.

We propose to develop an online method that segments a 2D metric map created by a mobile robot by using 3D features detected from a RGBD camera.


The 3D features detected from the a RBDG camera, extracted from a pre-trained DNN, are used to provide a virtual sensor for the robot that detects that the robot has moved from one room to another one.




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Task-planning for a Cobot




Develop a web-based visual programming tool able to compose several simple robot tasks as:

- move the robot to a position (x,y)
- detect user
- talk
- listen to answer

In order to define more complex behaviours

- patrolling
- provide instructions and indications
- provide a service


Final goal is to implement, on pre-existing technologies, a fully working Cobot (collaborative robot) as a web service



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Adaptive parametric regression

Boosting regression

Adaptive regression through neural networks


Incremental construction of the model.

Implementation and evaluation on standard benchmarks.


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Emotional interaction of robots




- Emotional content is one of the main m of human behaviour
- Robots have a limited or absent facia mimick and have to resort to body language to convey emotions.
- We explore the use of integrated video display and motion of a Giraff robot for maximize the interaction experience.



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Empathic Virtual Character

Description
 Realizzazione di un avatar 3D modulare, empatico ed interattivo da utilizzare in applicazioni real time 3D (Serious Games).
 L'avatar deve essere in grado di eseguire animazioni di idle, camminata ed effettuare animazioni facciali per trasmettere stati d'animo quali felicità, tristezza, stupore, ira.
 Il comportamento del personaggio virtuale verrà gestito tramite una macchina a stati finiti probabilistica.



Background
 Basic 3d modelling techniques (Blender 3D)
 Unity 3d game engine

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