

### **3d Vision for obstacle clearance on a Robotized Wheelchair**

This project aims at "giving eyes" to a robotized wheelchair able to handle difficult terrains of everyday life of disabled persons: including stairs, escalators, getting into a car trunk or into a train...

The project is done in collaboration with Mr Christophe Cazali who invented and patented the wheelchair (see [Publication PCT](#)).

The wheelchair has 4 legs with two 1-axis motorized joints + 1 motorized wheel. This mechanism enables the wheelchair to cross obstacles while keeping the seat always horizontal and statically stable.

The movement is driven by a controller using some position sensors and a 3D vision sensor.

Some studies already worked on setting up the simulation model and controller in Webots/Python environment.

Now one remaining big challenge is to start and develop the 3D vision module:

The study could be scaled depending on student's competency and availability. It means that it could be adapted to:

- M1 project (e.g. 1day/week for 4 months): develop and implement in Webots the obstacle detection and localization algorithm from current Webots model images (TOF camera-like images) on a limited range of obstacle scenarios (e.g. 3 steps up and 3 steps down)
- M2 project or stage (e.g. full time for 5 months): M1 project scope + extend the range of obstacle scenarios (other shapes or bad quality images) in Webots + optimize performances (precision, real time, errors...) + confirm the choice of sensor type for target application (bench study of available technologies to find best balanced solution for cost, performances and limitations) + possibly prototype and test the algorithm on a real sensor.

For information, in the medium term, this study should lead to the creation of a prototype that could participate to some robotic competition like the Cybathlon challenge, and in the long term to a product for persons with reduced mobility.

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