Panther

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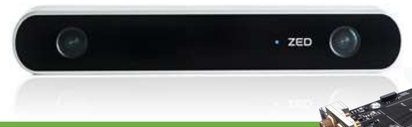
Powerful Autonomous eNTity High-End Robot (Panther) is a tracked robot made to explore an outdoor environment. It is built with different materials plexiglass, aluminium and plastic and different technologies. It has 9kg of weight and has a size of 42cm with, 40cm deep and 30cm height, with a ground clearance of 7cm.

Chassis

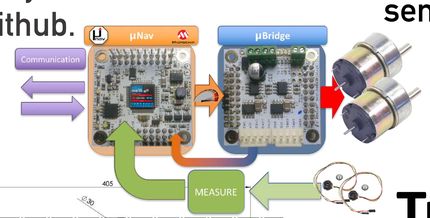
The heartbeat is:

- NVIDIA Jetson TX1
- ZED stereolabs camera
- µNav motor control



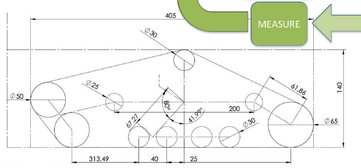
µNav

It's a little powerful motor control board in 4x4cm and is open source and open hardware project is fully available on github.



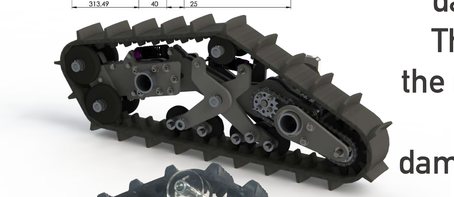
ZED camera

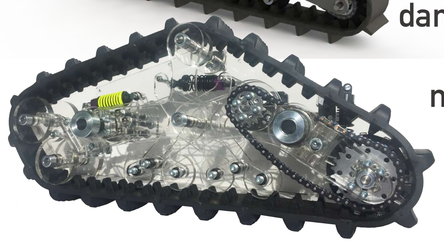
The ZED Stereo Camera made from stereolabs is a lightweight depth sensor based on passive stereovision.



Track

Each Track have three parts that move on an axis connected with dampers. The tracks are built with plexiglass and aluminium. The first part (in front) with four passive wheels can tilt. When the robot climbs little rocks, on centre is assembled the traction subsystem and a subsystem composed by four wheels to damping the vibrations when the robot moves, this system have a look like a scissor. On rear each tracks have a block to maintains the tightens belt and transmits the motion from the motor to the track.





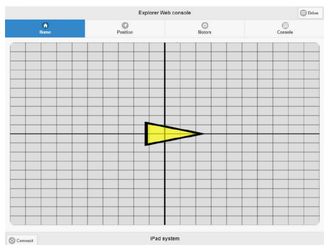
ROS

With the Robotic Operative System (ROS) framework and the collection of tools, libraries Panther interact and move inside the environment. Different nodes are used to control the robot. A first node to send the set point to the µNav, a second to receive the information from the ZED camera, IMU and wheel to recognize itself inside the world, another to forward all telemetry information via web, and another to collect the information to build a little “dictionary” of the world. All configuration nodes are available on develop area.

Navigation

Panther have inside different type of sensors, an Inertial Motion Unit (IMU), a stereo camera, encoders, ultrasonic sensors and other, with an Extended Kalman Filter, available in ROS, the robot can localize itself inside the world and reduce the measure errors. Another ROS node fuse the measures from all sensors and transmits it to the web interface and to the PC telemetry client. The outdoor platform uses the µNav motor control board to move the Tracks via two DC brushed motors, a ROS node bridge convert information from the supervisor to the traction system. All nodes work together for the autonomous navigation of the robot. **https://youtu.be/JXfRS9BNM1I**

Reconstruction



Since the odometry of the robot is often erroneous we cannot rely directly this measure to localize Panther in the environment, it uses the Simultaneous Localization And Mapping (SLAM).
This process consists of a number of steps, filtering the information from different sensors, estimate the position with cameras, reobserving the environment robot moves around and updating where the robot thinks it is based on these features. The goal of the algorithm is to use the features in the environment to update the position of the robot. Panther uses different type of SLAM, usually start with the 2D SLAM and after with a 3D SLAM to reconstruct the world. **https://youtu.be/r_Z3NF-z5V8**