

Simulation-Based Engineering Lab
University of Wisconsin-Madison
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ART Broly

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1 Vehicle Platform and Sensors

Our Autonomy Research Testbed (ART) vehicle, called Broly, is equipped with a Jetson AGX Xavier for on-board computing, along with a camera, two IMUs, and a RTK-GPS.



Figure 1: Art-Broly

1.1 Nvidia Jetson AGX Xavier

We use a Nvidia Jetson AGX Xavier that consists of a CPU having 8 cores and 16 GB RAM at 2.2 GHz. The Jetson runs Ubuntu 20.04. It also hosts a Volta GPU with 512 Cuda cores and 16 GB of global memory.



Figure 2: Jetson AGX Xavier

1.2 ELP USB Camera

We use a ELP Megapixel USB Camera with 2.1mm lens. The camera has a high frame rate MJPEG 120fps@640(H) x 480(V), 60fps@1280(H) x 720(V), 30fps@1920(H) x 1080(V). It has a 2 megapixel high pixel technology for sharp image and accurate color reproduction and a 2.1mm HD wide angle lens for wide view range.



Figure 3: ELP USB Camera

1.3 SBG Ellipse2-D INS

The SBG Ellipse2-D INS is a compact, high-performance sensor that offers precise navigation and motion sensing capabilities. It is equipped with a dual-antenna, multi-band GNSS receiver that ensures accurate heading and position data, even in areas where GNSS signals are weak or disrupted. It delivers roll and pitch accuracy to within 0.1° , heading accuracy to within 0.2° , and velocity measurements with an accuracy of 0.03 m/s.



Figure 4: SBG Ellipse2-D INS

1.4 Wheeltec IMU

The WHEELTEC N100 IMU Module is a versatile, high-precision attitude sensor tailored for ROS robots, offering dynamic angle accuracy of 0.1° RMS and a high output frequency of up to 400Hz. It supports robust data exchange with a Type-C USB interface and is designed for durability, withstanding 10,000 plug cycles. With pitch/roll accuracy of 0.05° RMS statically and 0.1° RMS dynamically, and heading accuracy assisted by magnetometers at 0.5° RMS, it's ideal for precise navigation tasks.



Figure 5: Wheeltec N-100 IMU

1.5 Sparkfun ZED-F9P RTK-GPS

The SparkFun RTK-GPS with the ZED-F9P module is a high-precision GPS unit that leverages Real Time Kinematics (RTK) to achieve centimeter-level accuracy in location tracking. The ZED-F9P is a GNSS receiver, capable of multiple frequency bands, which allows for concurrent reception of GPS, GLONASS, Galileo, and BeiDou signals. This multi-band capability enhances the positioning accuracy to be within 1 to 2 cms.



Figure 6: Sparkfun ZED-F9P RTK-GPS