

JetBot

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Sponsor: The Aerospace Corporation



Problem Definition

- Limited amount of Small-scale autonomous devices
- Some devices are only capable of performing a single task
- Not many devices are targeted towards families

Problem Statement

We want to develop a semi-autonomous rover capable of monitoring a users child at any given moment while providing a user with real-time footage of the child



Design Requirements

Target Product Specifications

- Power: Micro USB (5V 2A) or DC jack (5V 4A)
 - Last at least 1 hour
- Storage: Micro SD card slot
- Camera: 720P HD camera
- Connectivity: WiFi
 - Alternative: Bluetooth



Rules & Regulations to Abide by

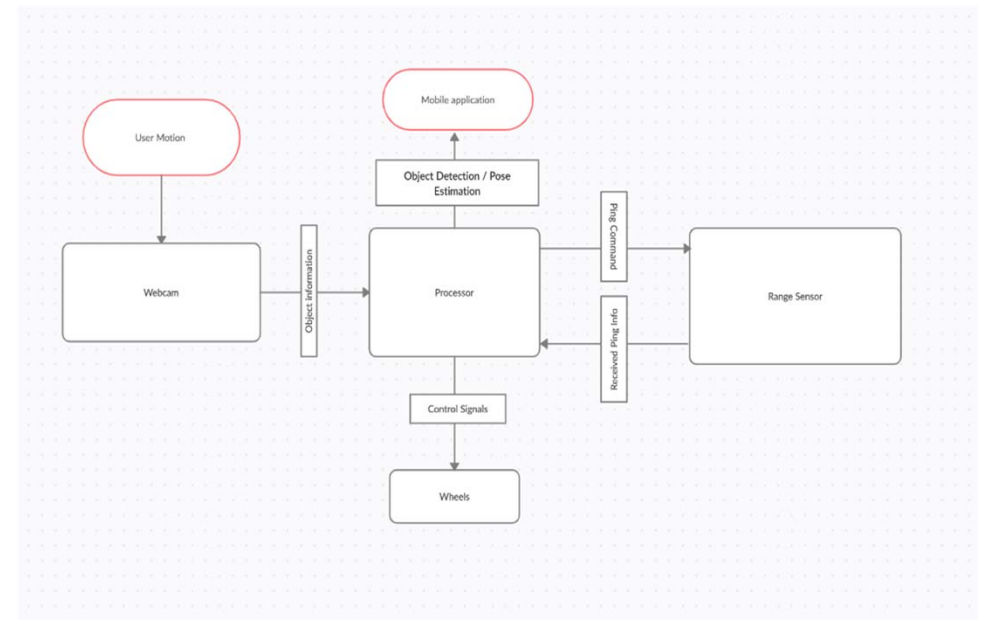
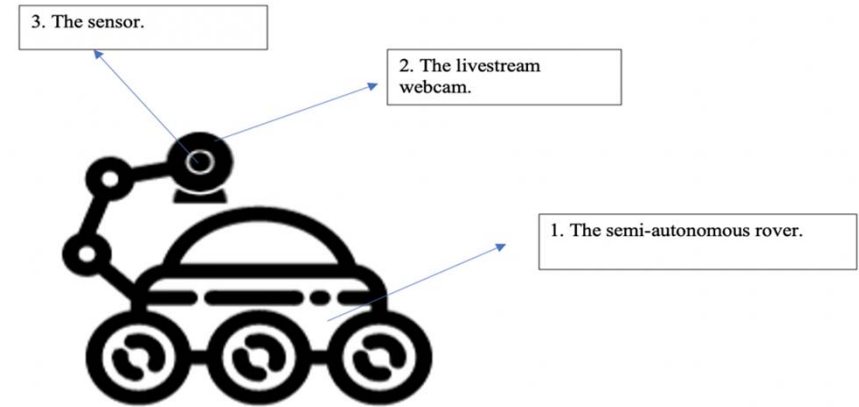
- Cybersecurity
 - Mobile Industrial Robot(MiR) network
 - <https://www.mobile-industrial-robots.com/media/6124/2019-02-13-mir-network-requirements.pdf>
 - Hackers are everywhere
 - We want to ensure that the rover has protection over the hackers

Constraints

- Cost : Estimated budget of \$5,000
- Time: We are limited to a time-span of one school year
- Environmental
 - Limited to inside use
 - Must be able to navigate around objects

Top Solution Design

- JetBot (Formerly Watch Bot)
 - Live stream recording of child
 - Ability to follow child when moving, from a safe distance
- An object is placed in front of the rover
 - In our case: A toddler: 2-5 years of age
- The rover senses that the toddler is in front of it
- A live stream is sent to the parents mobile device
- When the toddler moves outside a threshold, the rover follows them

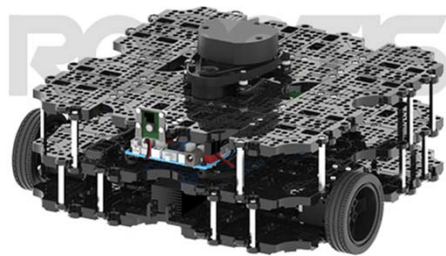


Sprint 1

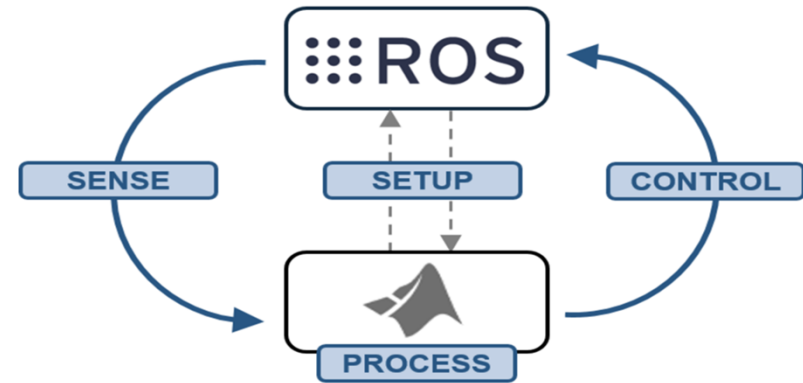
- User Interface development

Parts Ordered:

- Jetson Xavier NX
- Turtlebot 3 Waffle Pi
 - Camera - Raspberry Pi
 - Lidar - Navigation



- ROS Review
 - ROS 1 vs ROS 2



Sprints 2

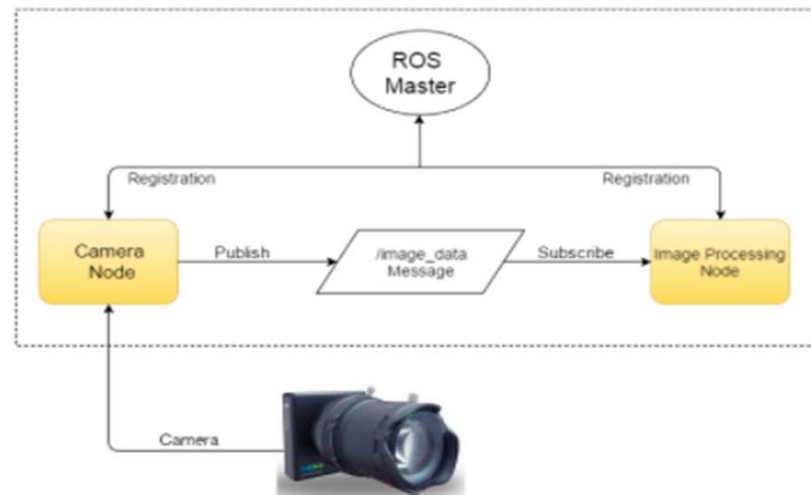
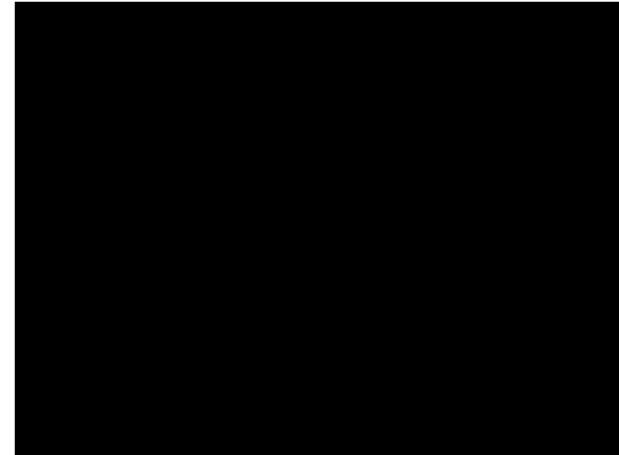
- Initial Jetson Xavier ROS setup, ROS Review

ROS Version:

- Ubuntu 18.04
- ROS Melodic (ROS1)

Nodes:

- Jetson_csi_cam
- rosbridge_server



Sprints 3

Parts Received:

- Turtlebot Waffle Pi 3
 - Raspberry Pi Camera
 - Lidar
- Jetson Xavier NX
- Power Bank
- Mouse and Keyboard

Initial Setup:

Part 1: Flashing Jetson OS Image to MicroSD card (BalenaEtcher)

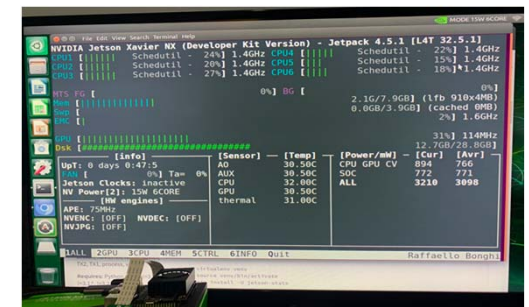
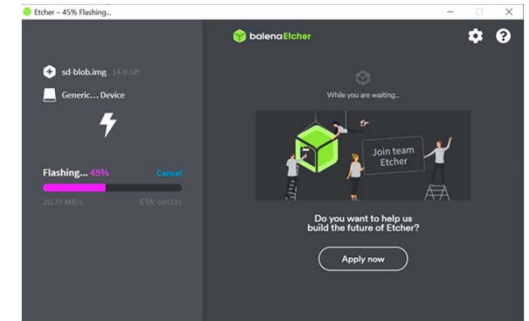
Part 2: Attaching Camera, MicroSD card and Keyboard setup to Jetson Xavier NX

Camera Setup

- Connected Camera to Xavier Nx
 - jetson_csi_cam
- Enabled the camera to stream online
 - [web_video_server](#)

Rosbridge Server Connection

- Created a server to send information to our website
 - Rosbridge Server node
- Reconstructed our website to display contents of the camera



Conclusions

The goal of our project was to create a semi-autonomous rover that could assist parents in watching their child. Because of procurement and unexpected time constraints, we had to resort to only fulfilling our minimum viable product (MVP).

Even with a time constraint of approximately two weeks for implementation, our MVP was fulfilled. We were able to establish a user interface with a live stream camera to ensure the safety of a users child while taking care of other tasks.

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