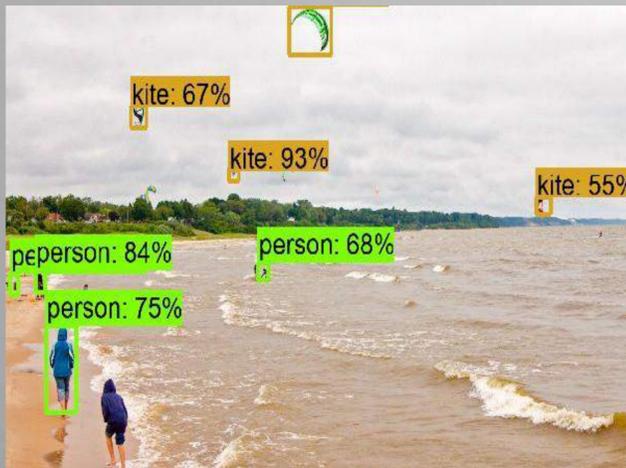


Overview

NASA astronauts deal with long, complex procedures and often have to call ground control for guidance. Our project, Watchdog, aims to use AI to verify astronauts' fidelity to standard procedure and offer suggestions during deviation. This project fuses two approaches; an event guidance language and a network of sensors (camera, NFC, IMU, Bluetooth Beacon), embedded in astronaut equipment. It identifies specific subtasks and understands the ordinal relationships between them, with the goal of a comprehensive autonomous mission guidance system.

Computer Vision



Convolutional neural network-based single-shot multi-box detection for object recognition.

Final Product



Hardware



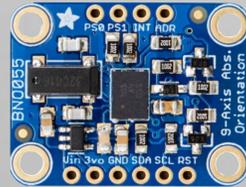
Nvidia Jetson TX2

The development board contains an ARMv8 Multiprocessor CPU Complex with abundant interfaces, and a 256 core Nvidia Pascal GPU to support image recognition.



PN532 Near Field Communication

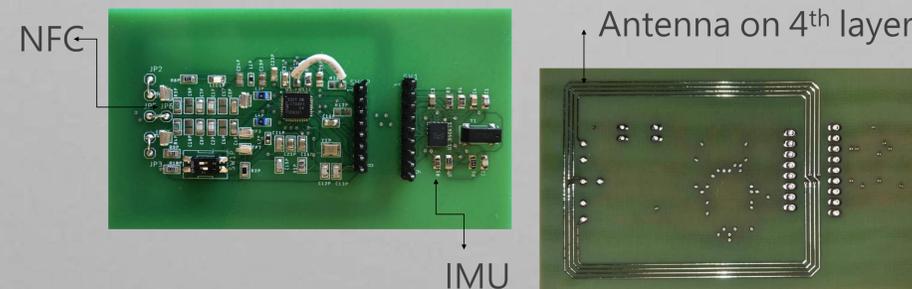
Features a 10cm transmission range of signals. It uses I2C to communicate with TX2. It is used for object detection.



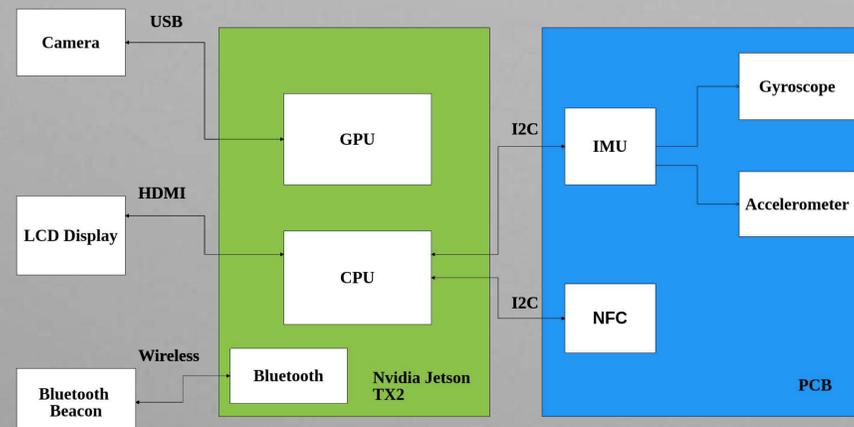
BNO055 Inertial Measurement Unit

Features a 9 degree of freedom accelerometer. It is used for precise motion detection via I2C.

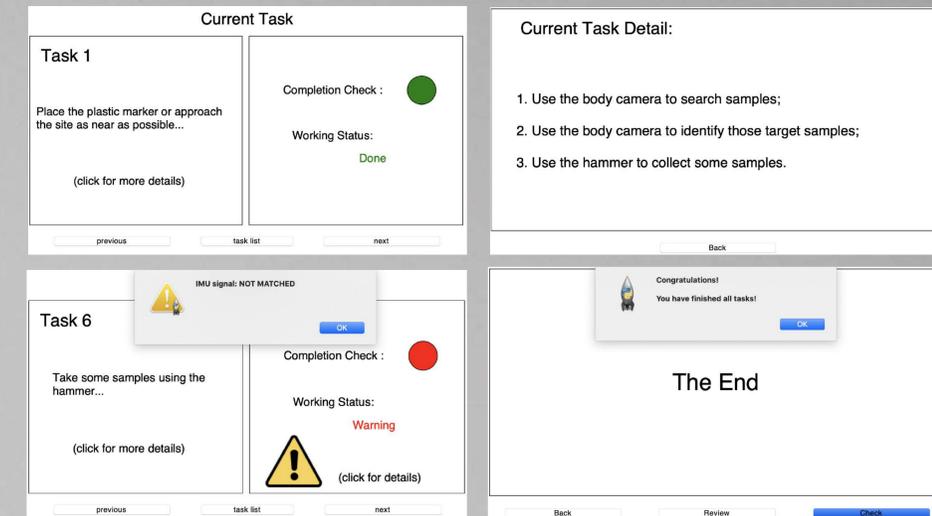
PCB



Block Diagram



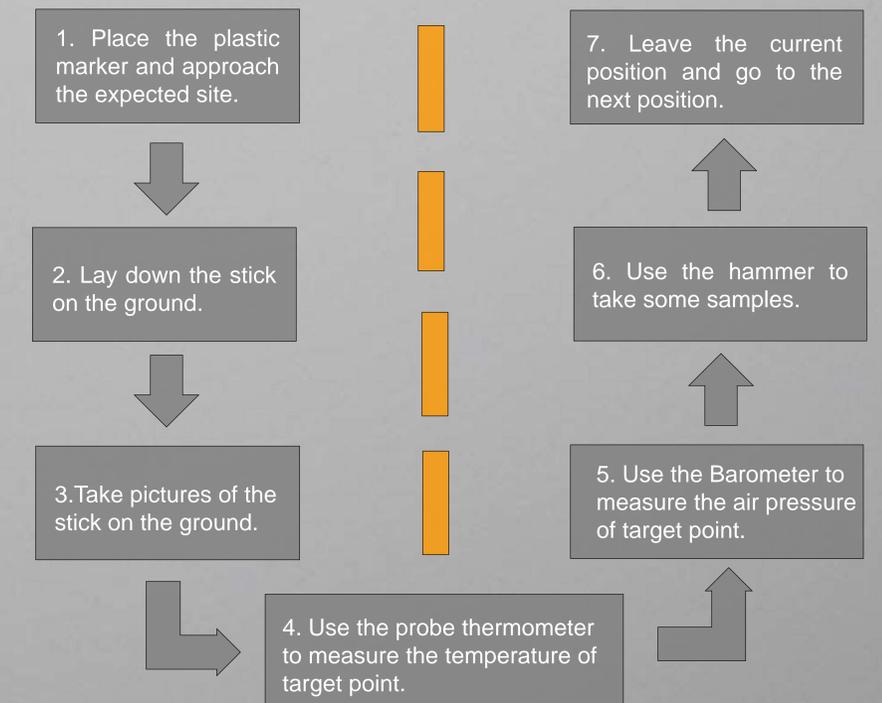
User Interface



- Click left part of interface to show the task detail.
- Click right part of main interface when working status is Warning to show the warning message.
- Use 4 colors to indicate different working status.

Green -- "Done" Gray -- "Waiting"
Yellow -- "In-progress" Red -- "Warning"

Task Flow Chart



Acknowledgements:

We want to extend our sincerest gratitude for the advice and guidance of Professor Yogananda Isukapalli, Teaching Assistants Brandon Pon and Carrie Segal, and Jessica Marquez and Richard Joyce from NASA.

