WEEK 10

ROBOTIC IOT SMARTSPACE TESTBED

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How do we create scene inferences from sensor data?

What is an IOT?

- IoT - **Internet of Things**
  - Network composed of **multiple devices** which **communicate** with each other

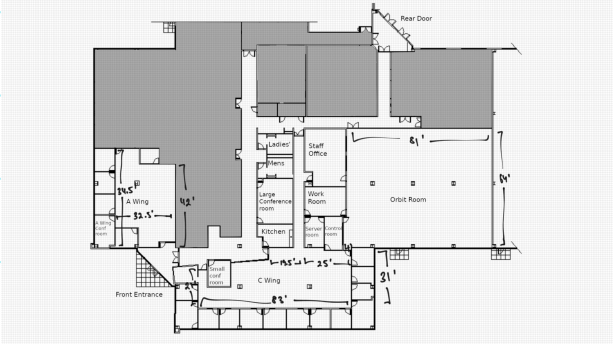
Project Overview

Goal: Create an **IoT Testbed** from sensors

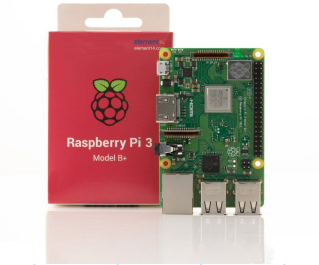
Train neural network about human actions

1. Recognize **predetermined set of activities** in office
2. Communicate using **zero-shot/few-shot** recognition
3. Create **narrative** about space

Create a website with sensor data & robot access



Hardware

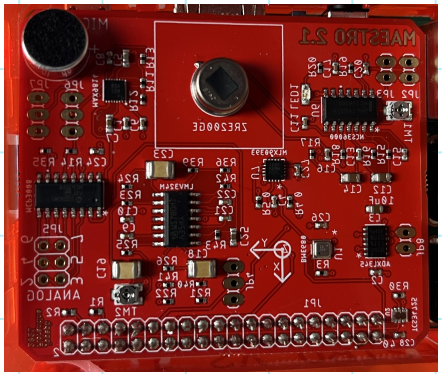


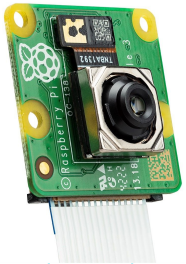
Raspberry Pi

Model 3B + & Raspberry Pi OS Lite (Legacy)

MAESTROs

Custom multi-modal sensor
- Temperature, RGB value, audio, etc.



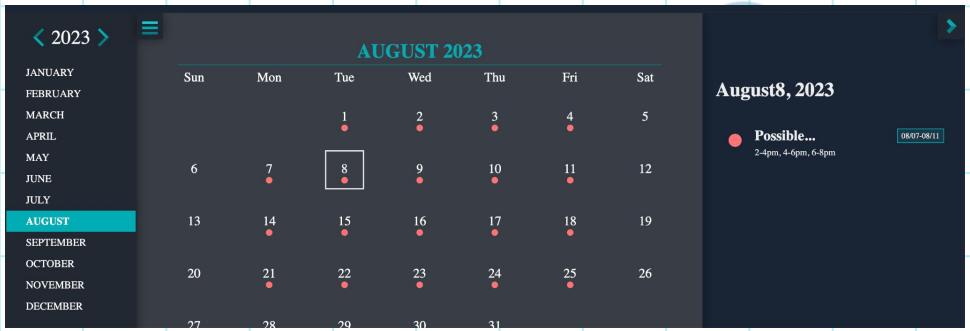


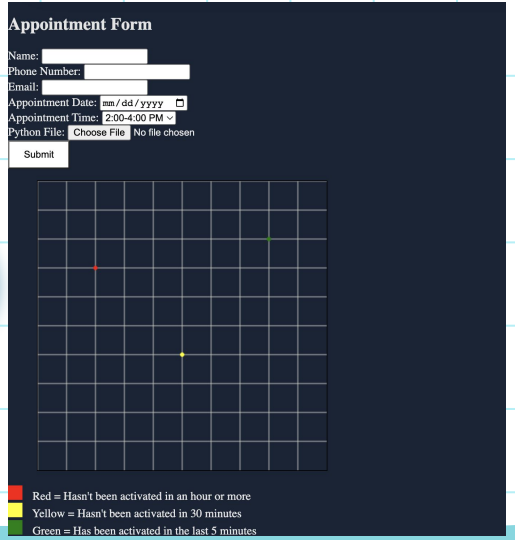
Camera

Data used to label human actions & speech

Website

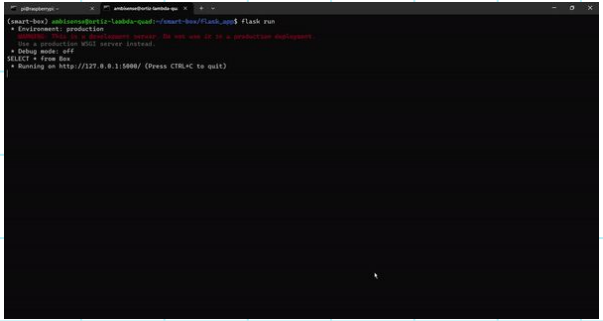
- Email sender
- Appointment form compatibility for robot
- Interactive grid
  - Name, online status, real-time sensor data

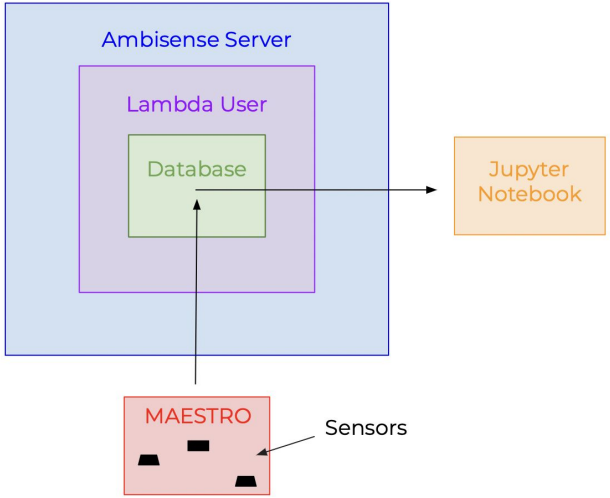


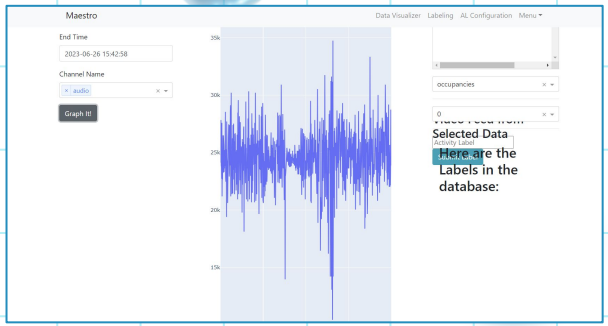


Database Architecture

1. Server: **Ambisense**, User: “**lambda**”
2. Contains **smartbox** database where MAESTROs’ send information
3. Data accessed with **Jupyter Notebook**, visualized on web page





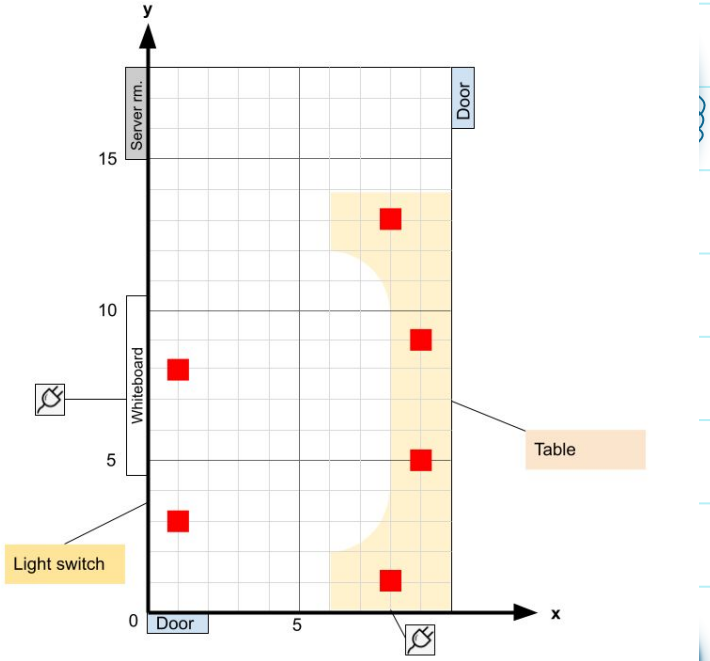


PTP

- Protocol that **synchronize clocks** throughout computer network
- Connected **sensor data** to the **camera input**
- Sent to database within **nanosecond** scale

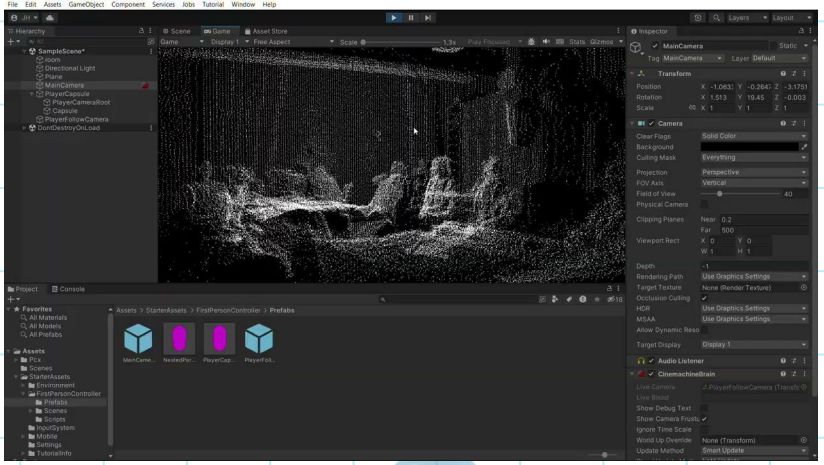
Coordinate System

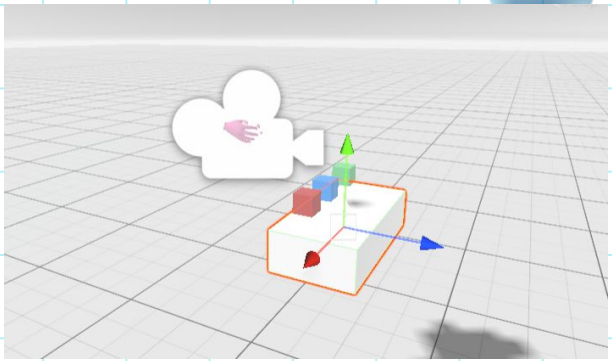
- Upgraded version of coordinate system on website
- MAESTROs placed based on:
  - Predetermined activities
  - Outlets



Unity/Robotics

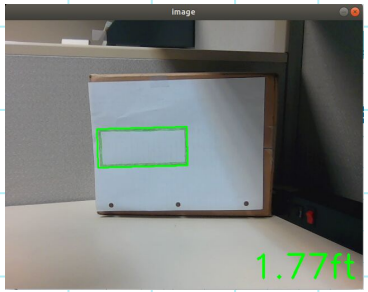
1. Avatar that mirrors webcam feed
2. VR Pick-up demo
3. First-Person Point Cloud Navigator

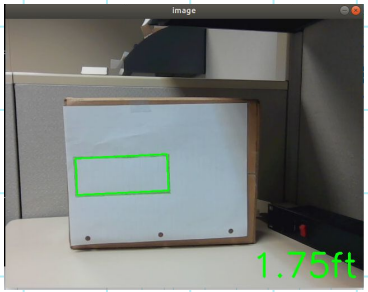


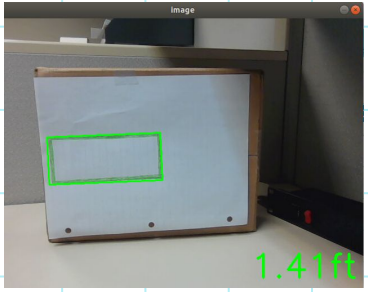


OpenCV

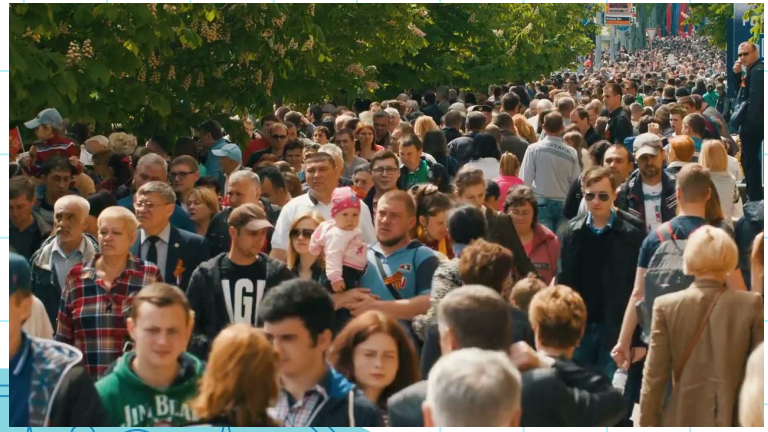
Distance to camera

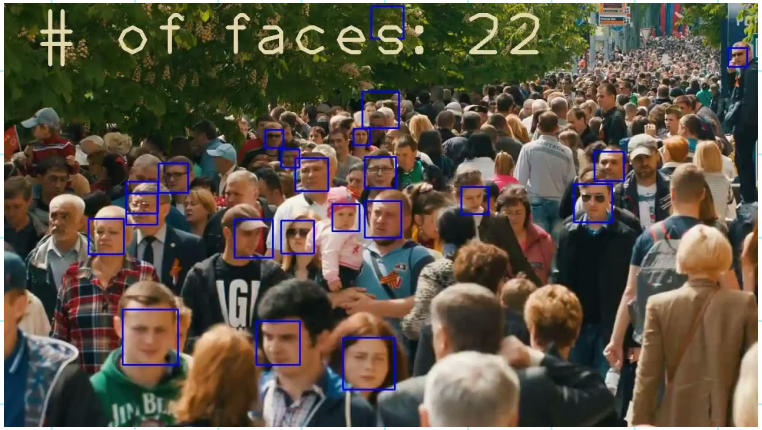






Facial recognition





Neural Networks

Future Work

1. Hardware for PTP:
    - TimeCard mini Platinum Edition from OCP-TAP
2. Set up Maestros/Cameras in coordinate grid
    - Data collection/labelling
    - LIDAR Robot ?
3. Automatic labelling: Label activity using natural language descriptions of video data
4. Bridge gap between sensor-to-text