Summer 2020-
WINLAB Internship
ML for IoT group (Maestro)

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Weekday 9am-10am Occupancy Distribution
During a school assembly, the distribution changes significantly. Static evacuation routes remain unchanged.
A more efficient evacuation route would take advantage of empty hallways.
How do we enable such a system?

- Current occupancy distribution
- Hallway capacity measurements
- Quick information dissemination system
- Location of Emergency
Current Occupancy Distribution

- Do a deployment of non-intrusive sensors
- Ensure sensors readings are accurate
- Collect and analyze data in a central hub

Hallway Capacity Calculation

- Measure the speed of human movement in corridors during class, lunch hours, entrance/exit times.

Information Distribution

- Place lights on hallway floors
- Give smartphone apps to Fire Marshals connected to sensor system
Introducing SmartBox and SmartDash
System Design

SmartBox

Sensor Data Traces

Communication 9600 baud. PySerial library

Data cleaning, processing

Serial

USB

ARDUINO IDE

(Continuous)

Data Retrieval

mongoDB

Upload to Database in 10-sec Chunks

Activity Recognition ML Classifier

Activity

Web app, with graphs, activity labels

Asks user for uncertain labels, User corrects incorrect labels

Dash by plotly

SmartDash
Non-Intrusive Sensors Allow for Easy Indoor Data Collection

- Passive infrared motion detection
- Magnetometer
- Color and Illumination
- Audio Sensor
- Temperature/Humidity/Barometer
- GeoPhone
- WiFi Transceiver

This combination of sensors is affordable!
Please pick a graph from left new update.

Box Name
Box0

Start Time
2020-05-29 19:13:47

End Time
2020-05-29 19:14:47

Selected Data

Channel Name

Graph It!
Other Applications of SmartBox/SmartDash

Activities of Daily Life Monitoring

- SmartBoxes in homes of elderly people allows us to monitor their health.
- Classify what they are doing e.g. using a microwave or stove, vacuuming, walking.

HVAC System Fine-Tuning

- Active learning can help understand occupancy schedules and comfort preferences of occupants.
- Allows energy savings by keeping occupants comfortable, turning off HVAC when no occupants.
Future Goals

- Deploy SmartDash publicly
- Simplify interface for multiple SmartBox connections
- Start with SmartBox deployment on campus