

Multidisciplinary Projects in Robotics and Internet of Things

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EnCon

IoT/Robotics

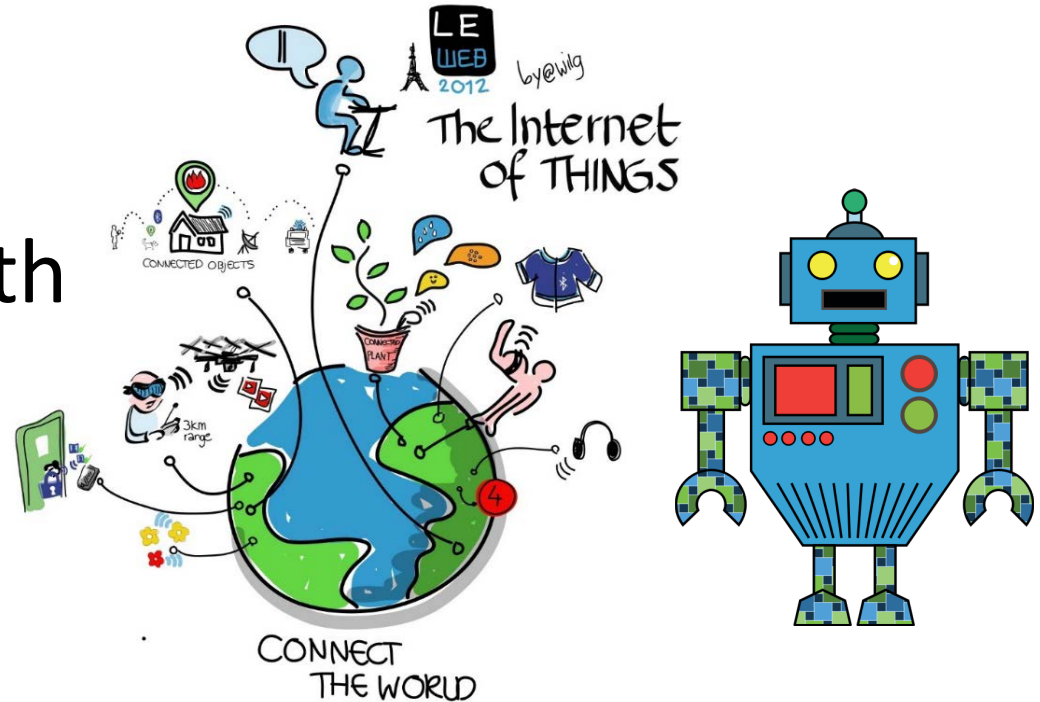
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Introduction

- Large Growth
- Multidisciplinary
- Breadth versus depth
- Requires a holistic view
- Varied implementations
- Challenges



Characteristics



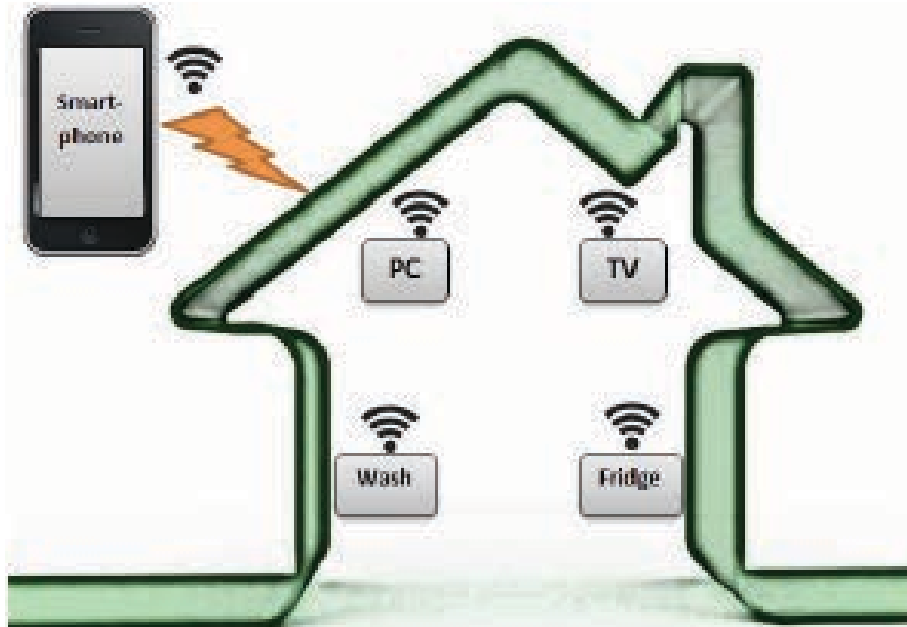
- Off the shelf hardware
- Multidisciplinary
- Novel content
- Machine learning
- Distributed computing
- Multiple sensor
- Sensor to sensor communication
- Single project

IoT Project

- Put Shimmer 3 IMU sensors with gyroscope on treadmills
- Hardware (ECE)
 - Radio communication
 - Compressed sensing
- Software (Math, CS)
 - Bluetooth communication
 - Machine Learning



Project Characteristics



- Wireless transfer of data
- Limited power
- Large amounts of data
- Machine Learning
- Feature Selection
- Signal Processing
- Distributed Information

Results

- Data features – mean, maximum, standard deviation of accelerometer, magnetometer, frequency and power spectra
- Created machine learning classifiers
- Used cross-validation
- Able to classify treadmill activity as no activity, running or walking at 98% positive rate
- This was done in real time on the treadmill



Challenges

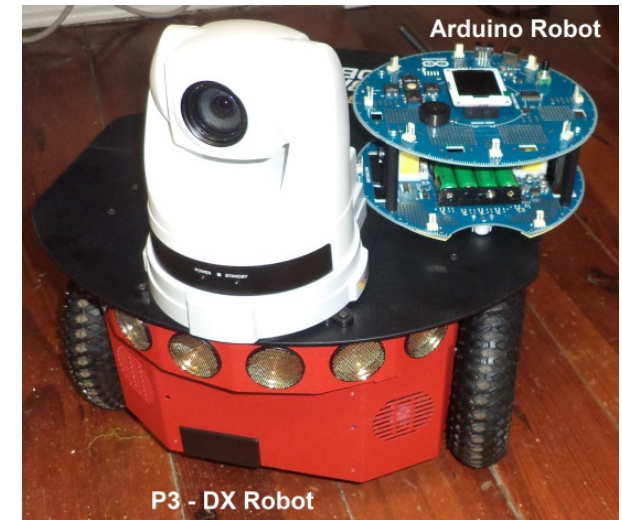
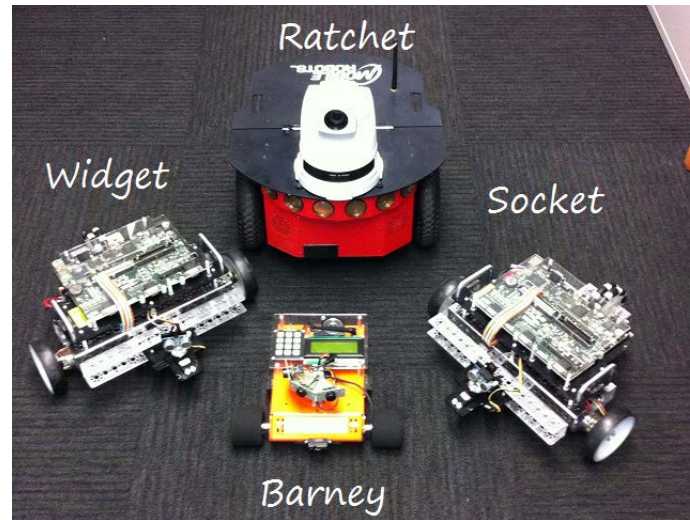


- Importance of Power consumption
- Challenging creating a ground truth data set
- Danger of overfitting data
- Assessing technical mastery may be difficult

Research & Educational Robots

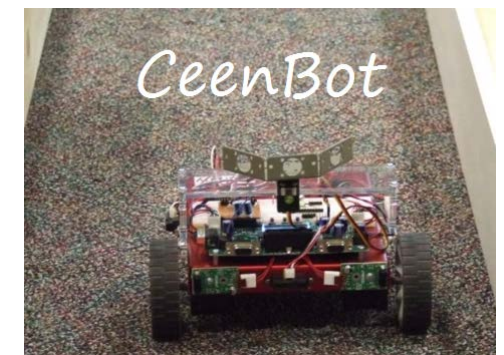
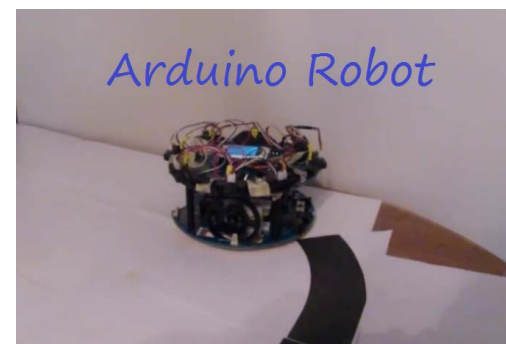
Research

Pioneer P3 - DX
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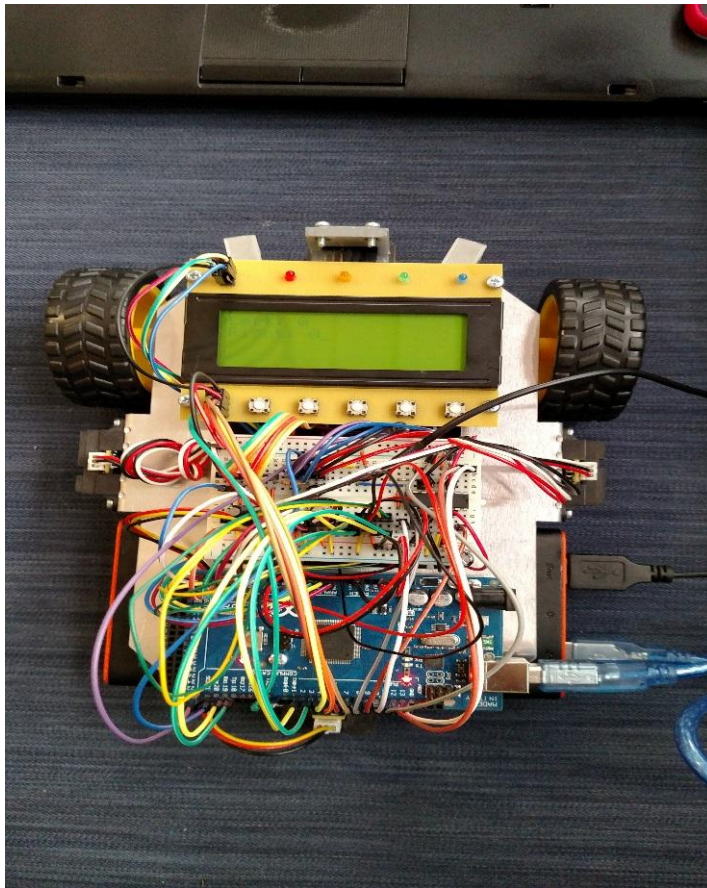
Education

CEENBot
Traxster
Arduino
Scribbler

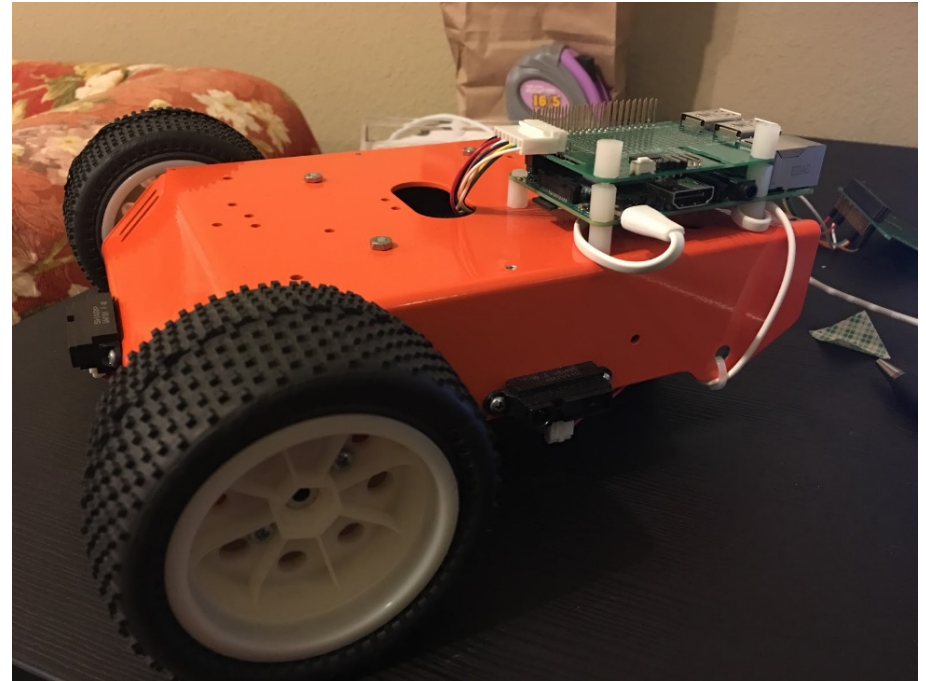


Multidisciplinary Robotics

Modular Controller



Modular Platform



Human-Robot Interaction & Collaboration



Future Vision

- Collaboration between internet connected devices and robots
- Humans connect to robot as servant, helper, assistant
- Mobile robot acts as security, sentry that communicates to human

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