

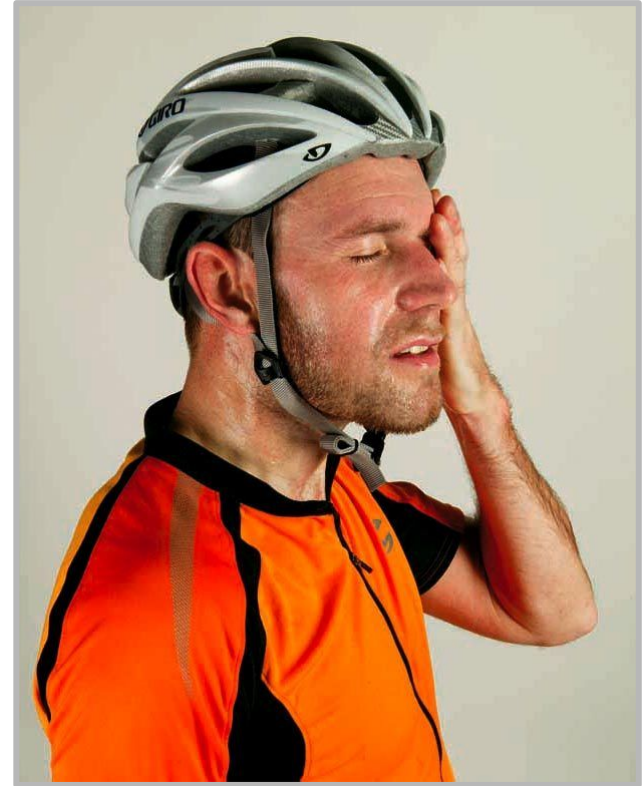
BikeMe:

Safer, faster bike
parking

November 28th, 2016

Connie Chen, Amy Fong, Mandy Kim,
Annie Rosen, Jessie Wang





MOTIVATION



TECHNOLOGY



IMPACT



DEPLOYMENT



DEMO



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BikeMe Overview

 **Scott Moura** @ScottMoura · Nov 22
Smart Bike parking system, by the CE186 BikeMe team!





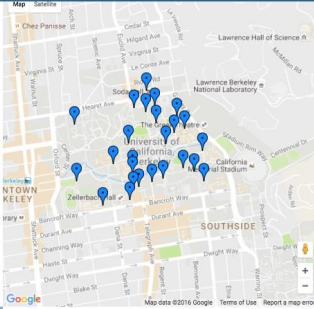
BikeMe Home Live Forecast Twitter Report Theft About

Live Feed
See how many bikes are currently at your bike rack of choice.

Bike rack location:

Refresh

There are currently 0 of 4 spaces filled.




Forecast
Planning ahead? Enter the day and time of arrival and get an estimate on bike parking availability.

Bike rack location:

Select your day and time of arrival:

ForecastMe!

Historically, at this day and hour, the rack has been 9.5% free.



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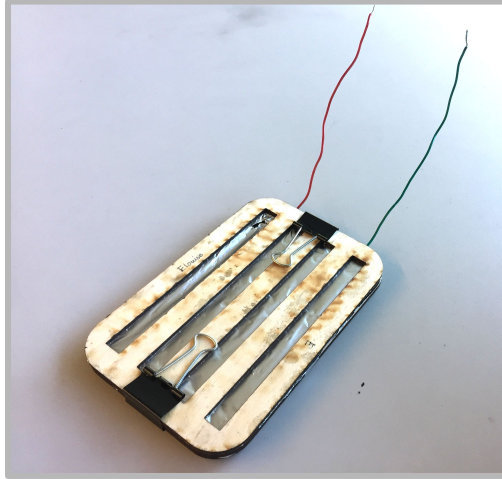
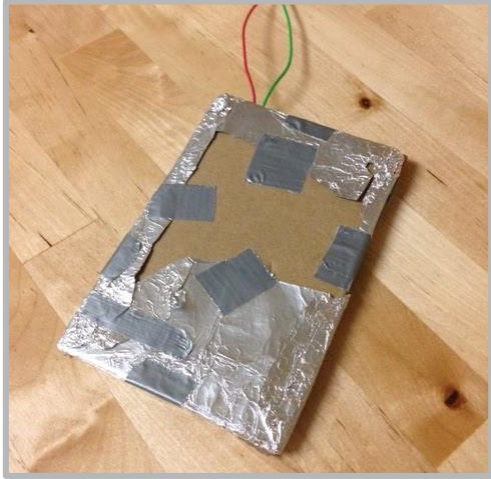
DEMO

Infrastructure and Sensing

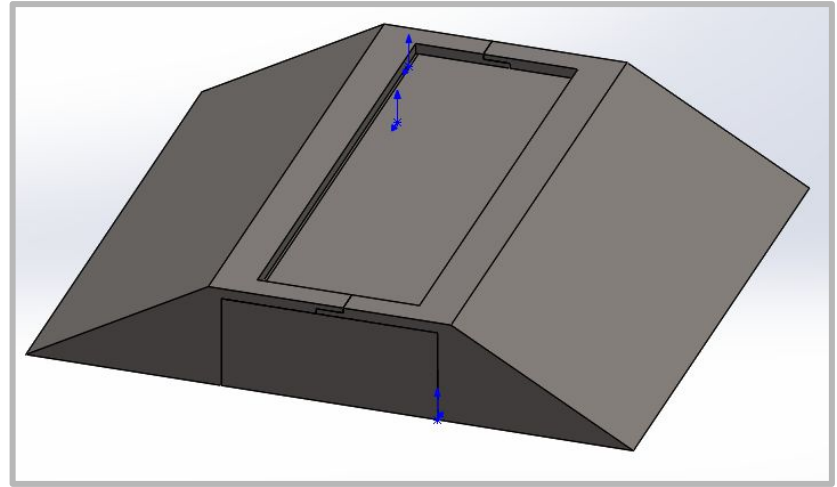
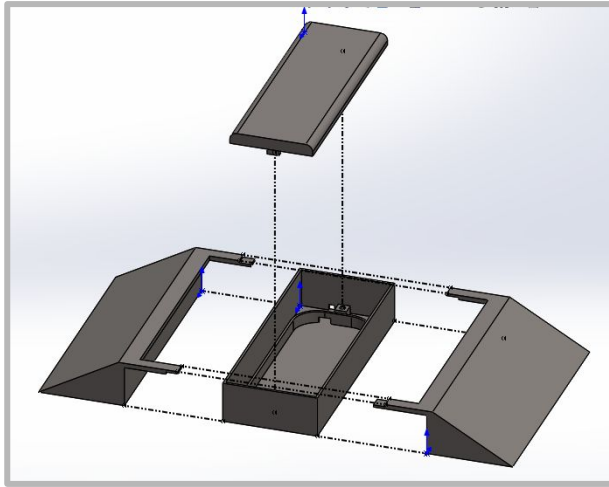
- 4 analog sensors on Arduino
- XBee (mesh of 1)
- AA battery power



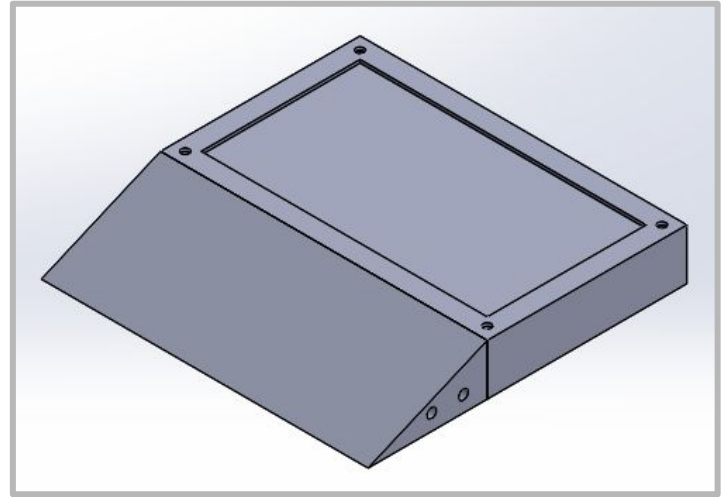
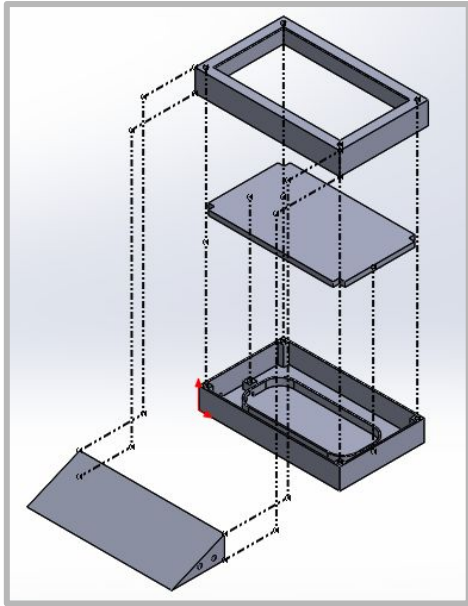
Sensor Design - Iteration I, II, III



Sensor Design - Iteration I



Sensor Design - Iteration II



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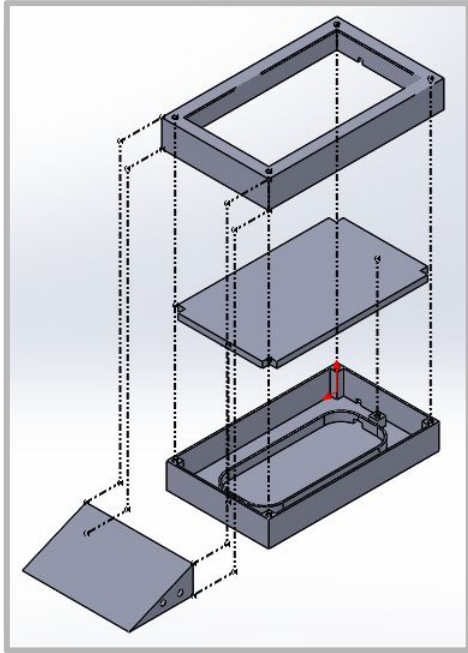


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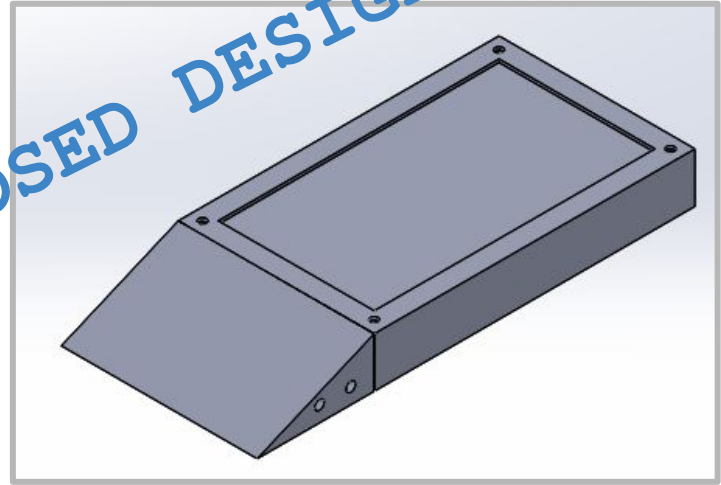


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Sensor Design - Iteration III



PROPOSED DESIGN



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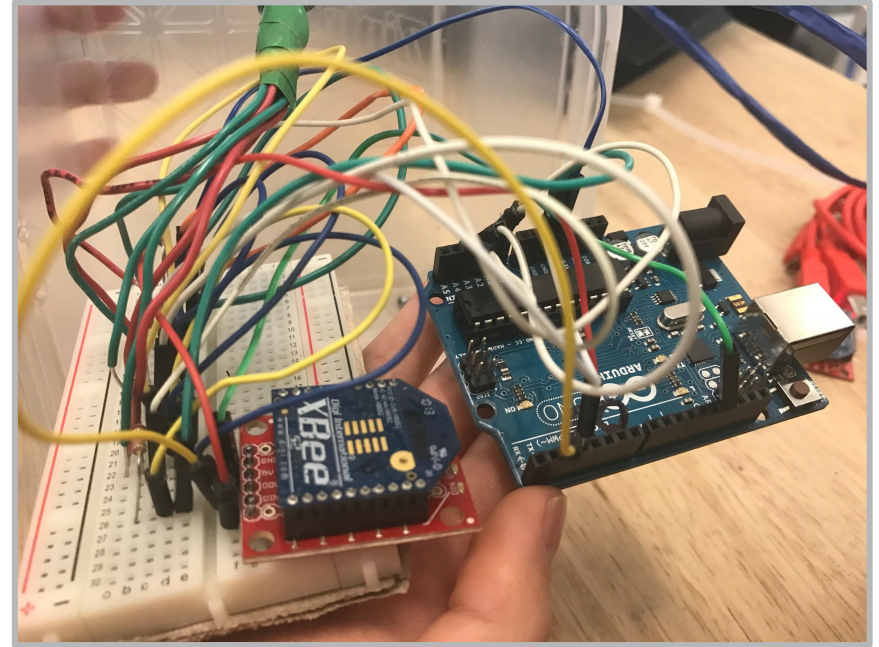
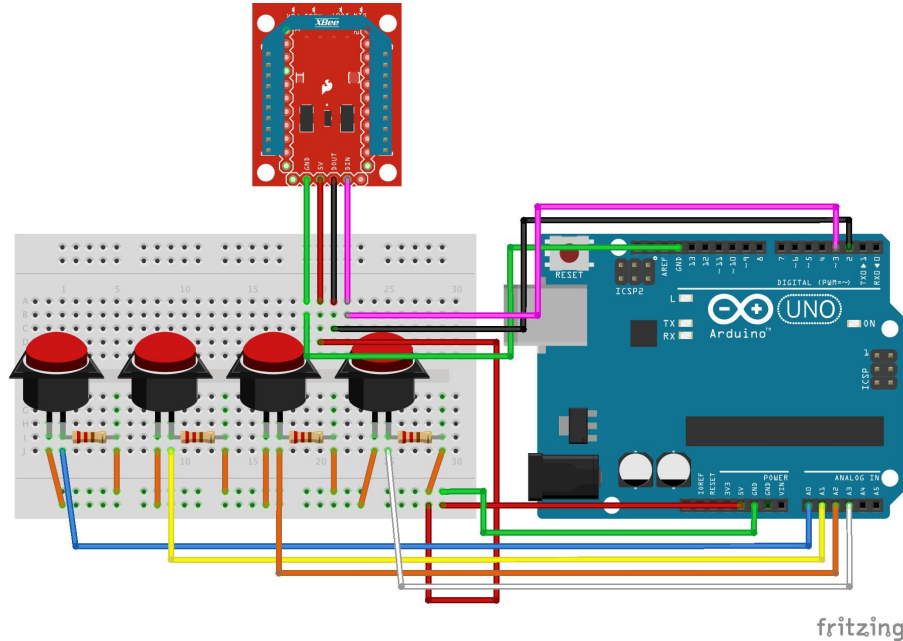


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Sensor Design - Wiring

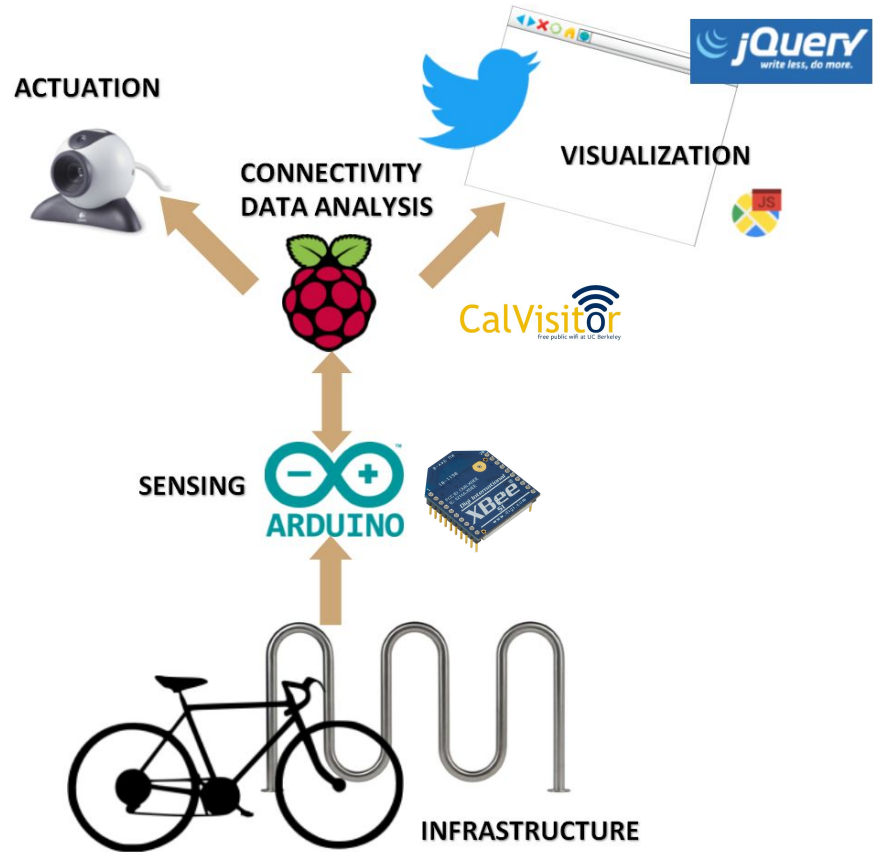


Connectivity



● Tools:

- Wall plug/battery power
- XBee (connector)
- Raspberry Pi Serial Port
- SQLite Database
- Wifi dongle
- Heroku server



Connectivity



- Raspberry Pi:
 - RPi will actuate picamera based on past and present sensor data
 - RPi updates SQLite database:
 - All raw data
 - Predictions for each day of week



Connectivity



- Cyber Layer:
 - RPi updates Wallflower Atto stream on Heroku
 - One prediction stream for each day of week and live data
 - RPi updates the prediction based on old and incoming sensor data



Visualization



Davis Bike Rack @calbikerme
Professional security guard (of bikes). Amateur field reporter. Personal philosophy: love your curves!
Berkeley, CA
calbikerme.herokuapp.com
Joined November 2016

Tweets 19 **FOLLOWING** 6 **FOLLOWERS** 5 **LIKES** 1

Tweets **Tweets & replies**

Davis Bike Rack @calbikerme · Nov 22
Looks like our twitter is back today!

Davis Bike Rack @calbikerme · Nov 22
Live from the Davis bike rack: 0.0% of parking available!

Davis Bike Rack @calbikerme · Nov 22
Our twitter will be temporarily down for the morning. Thanks for your patience!

New to Twitter?
Sign up now to get your own personalized timeline!
[Sign up](#)

Worldwide Trends
Delpo 157k Tweets
Justin Tucker 7,226 Tweets
البن جوجو 143k Tweets

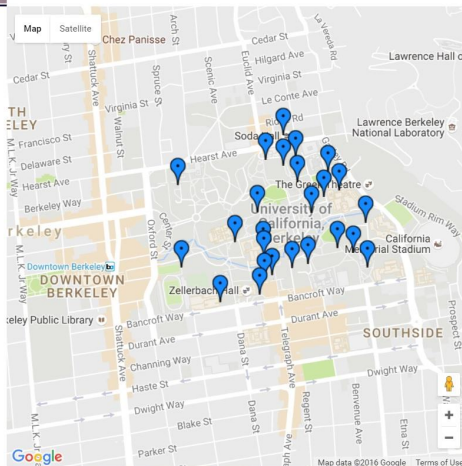
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Live Feed
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Bike rack location:
Davis 6th Floor Mezzanine

[Refresh](#)

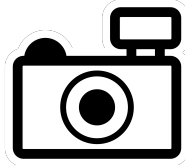
There are currently 4 bikes parked at the rack!



- Google Maps API to create map of bicycle racks throughout campus.
- HTML, CSS, Javascript



Actuation



- piCamera for Raspberry Pi can be controlled through the command line or Python
- Photos saved to Google Drive folder via wifi - unlimited storage!



Impact



- Half of 700 New York City office workers living within 10 miles of their job said they would bike to work if provided with safe lanes, secure parking, and wash-up facilities. (Pucher, J. et al., 1999)
- About 86,000 adult New Yorkers, 2.5% of all commuting residents, usually bike to work or school (NYC.gov)
 - 3.4 million who DON'T bike -> 1.7 million will begin biking



Impact



- The average commuter in New York City emits about seven pounds of carbon dioxide per round-trip commute for a total of 1,750 pounds of CO₂ each year (transalt.org)
 - 7 lb/commute/day * 1.7 mil commutes eliminated →



***11.9 million pounds of CO₂
not emitted per day in NYC
(5,400 tons)***



Impact

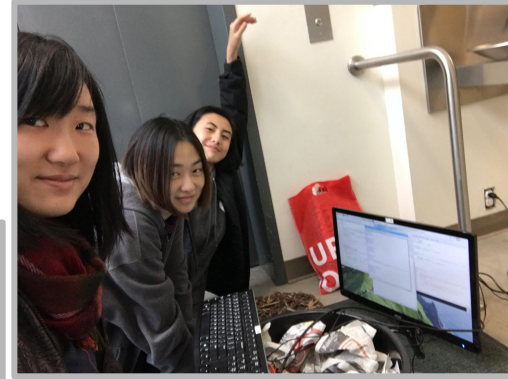
- **5,400 tons of CO₂ is...**
 - 600,000 gallons of gasoline
 - 0.16% of daily U.S. gasoline used



Deployment



- Successes
- Challenges
- Lessons learned



This is BikeMe

Help us with our CE 186 project to reduce bike theft!
Park on a pressure sensor as shown:

1)



2)



Find us at tinyurl.com/calbikeme



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Demonstration

- Pressure Sensor Demo
- BikeMe Website: bikeme.tk

