Team F

Kaylee Makel, Nancy Geronian, Victor Wilczynski,
Jeff Lee, Jung Moon Jang

Parking Meters at Carnegie Mellon University

Question & Motivation

Coin parking meters are becoming a rarity in today's technologically advanced era,
so why at Carnegie Mellon has there not been a technological improvement in terms of parking on its campus since CMU is known for being such a big tech hub?

Research Question

- We want to survey on campus parking meters to determine if there is a high frequency in unpaid meters.

- To add, we would like to see if there are any correlations between other factors, such as the estimated value of the car, time of day, day of week, color of car, etc.

Questionnaire

We used coding for some our survey questions in order to make data analysis a bit easier

1:Yes 0:No

1:Car 2:Truck 3:SUV 4:Van 5:Motorcycle/scooter 6: Other

Date	Location	Parking Meter	Vehicle Present?	Color?	Type?	Make?	Model?	State of license plate?	Expired meter?	Broken meter?	Ticket?	What for?	How much?	Clean (1) or Dirty (0)?	Registrat (license
Temperature	Tech St	1	1	blue	4	dodge	caravan	pa	0	0	0	0	0	0	
65		2	1	green	1	acura	3.2tl	pa	0	0	0	0	0	0	
Start time		3	1	black	3	toyota	4runner	pa	0	1	0	0	0	1	
12:10pm		4	1	silver	4	mazda	mazda5	pa	0	0	0	0	0	0	
End time		5	0												
2:10pm		6	1	gray	1	audi	a4	pa	0	1	0	0	0	1	
3/27/12		7	0												
		8	0												
		9	0												
		10	1	red	3	subaru	forester	il	0	0	0	0	0	1	
		11	1	blue	1	honda	civic	pa	0	0	0	0	0	1	
		12	1	white	4	mercedes	r350	pa	0	0	0	0	0	1	
		13	0												
		14	1	silver	4	honda	odyssey	pa	0	0	0	0	0	0	
		15	1	red	3	kia	sorento	pa	1	0	0	0	0	1	
		16	0												
		17	0												
		18	1	black	1	bmw	z4	pa	0	0	0	0	0	1	
		19	1	brown	1	mini	cooper	pa	1	0	0	0	0	1	

Additional information we recorded when completing the census

-Date
-Day of week
-Temperature
-Start time
-End time
-Total percentages of parked cars
-Surveyors

Reference Sheet

- Acura

- Audi

- ~~Beotlx~~

- BMW

- Buick

- Cadillac

- Chevy

- Chrysler

- Dodge

- Ferrari

- Fiat

- Ford

- GMC

- Honda

- Hummer

- Hyundai

- Infiniti

- Isuzu

- Jaguar

- Jeep

- KIA

- Lamborghini

- Land Rover/Range Rover

- Lexus

- Lincoln

- Lotus

- Maserati

- Mazda

- Mercedes

- Mercury

- Mini

- Mitsubishi

- Nissan

- Oldsmobile

- Plymouth

- Pontiac

- Porsche

- Rolls-Royce

- Saab

- Saturn

- Scion

- Shelby

- Subaru

- Suzuki

- Toyota

- Volkswagen

- Volvo

Color: try to fit color of vehicle to one of the following color schemes:

Red, black, blue, white silver/gray, gold/beige, purple, green, yellow

Type of vehicle: code the following:

1. Car/sedan
2. Truck
3. SUV
4. Van
5. Motorcycle/scooter
6. Other??

Make: Acura, Audi, etc. (use this sheet for answering the question)

Model: examples...

Focus, Accord, F150, Explorer, Trailblazer

Survey methodology

Date Started: 3/19/2012

Target Population: Meter Parking available to on campus for commuters to Carnegie Mellon Pittsburgh Campus

Sampling Frame: Campus Map of Parking Meters (Frew St, Tech St, Margaret Morrison St, Frew St, Morewood Parking Lot)

Sample Design: Census

Sample Size: 224 meters

Use of Interviewer: Data Collection by Observation

Mode of Administration: Netbook or Paper and Pencil

Computer Assistance: None

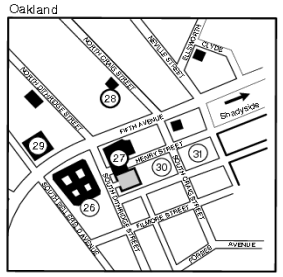
Reporting Unit: Parking meters

Time Dimension: One survey census

Frequency: Twice a day, Monday to Friday

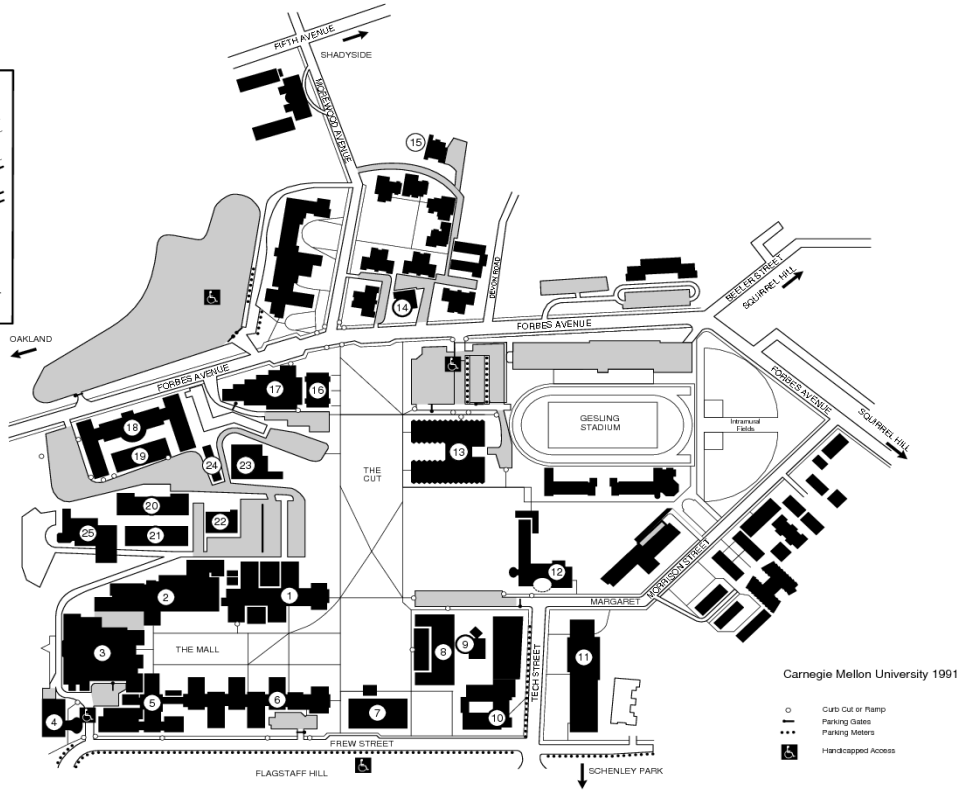
Map of Parking Meters

Carnegie Mellon University Campus Map



Academic Buildings

1. Doherty Hall
2. Wean Hall
3. Hamerschlag
4. Scaife Hall
5. Porter Hall
6. Baker Hall
7. Hunt Library
8. College of Fine Arts
9. Studio Theatre
10. Graduate School of Industrail Administration
11. Gymnasium
12. Margaret Morrison Carnegie Hall
13. Skibo Hall
14. 5017 Forbes Ave.
15. Bramer House
16. Warner Hall
17. University Computing Center
18. Hamburg Hall
19. Smith Hall
20. Field and Mobile Robotics Building
21. Mine Safety Laboratory Building
22. Planetary Robotics Building
23. Publication and Printing Building
24. West Garages
25. Physical Plant Building
26. Mellon Institute
27. Software Engineering Institute
28. College Club
29. Bellefield Towers



224 Meters

Margaret Morrison: 5

Tech: 29

Frew:168

University Center: 6

Morewood Parking: 16

Data Collection Schedule

Initially we made two time variables to further study morning commuters, from 8 am to 12:30 pm, and afternoon commuters, from 12:30 pm to 5 pm. Our data collection for our survey and break up of surveyors went like this:

M W F Data Collection		
Jung Moon/(Nancy and Victor help)	Morning	9:00-12:00 PM
Victor/Nancy	Afternoon	3:30-6:30 PM
T Th Data Collection		
Jeff	Morning	9:00-12:00 PM
Kaylee/Nancy	Afternoon	12:00-3:00 PM

Census

Difficulty in collecting data:
During Rush Hour
Student Class times

Glitches/how we fix 'em?

Ineligible unit:

1) cars parked in between spaces

2) double parking

3) vehicles that were parked, but being attended

4) CMU Transportation cars parked in parking spaces behind Morewood

5) cars parking at meters that we passed already and marked as not present

Possible errors

Possible errors from:

1) making best judgement on colors (basic colors used)

2) missing values

3) higher nonresponse rate from drivers driving away because they noticed we were taking notes on their cars and whether they paid the parking meters or not

4) can't tell if the meter is broken or not

5) Mon/Wed afternoon: meters behind Porter were unpaid

Interesting features from collecting data

Nonresponse rate and measurement error

Nonresponse rate:

- Calculated for number of cars at the meters using data collected Monday through Thursday in the afternoon
  - around +/- 7
- Calculated for unpaid meter using data collected during afternoon periods from Mon through Thurs
  - about ±9

Improvements

- Changed variables
- Find better relating variables (times left on the meters)
- Better coding for entering data
- Add Saturday
- Data recording technique

Successes

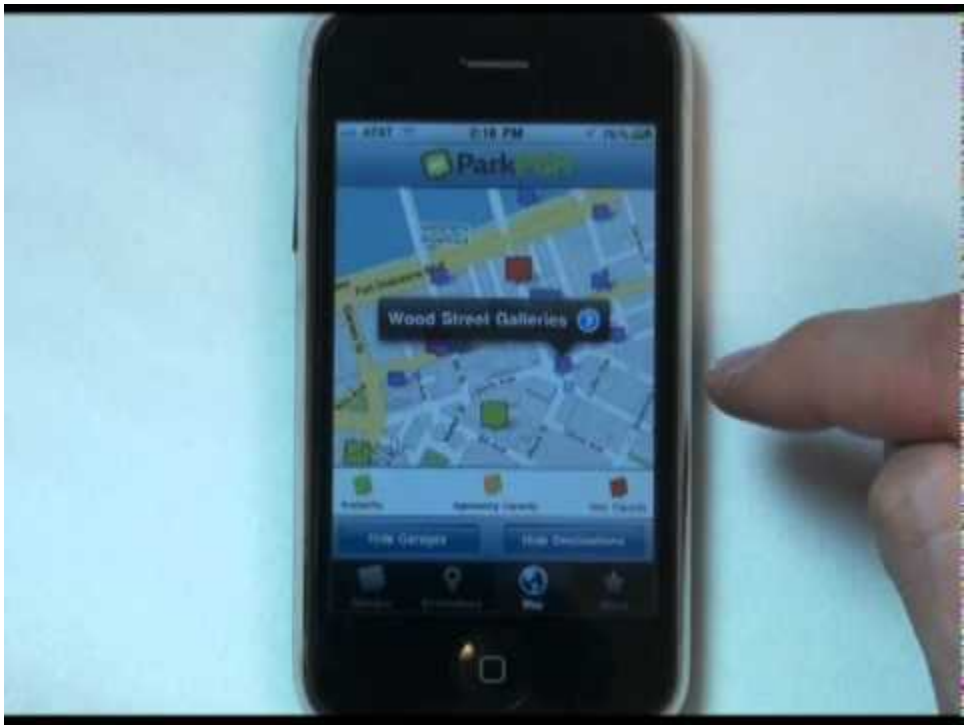
- Getting census done in about 2 hours instead of 3
- Finished collecting without complications
- Weather was not a variable
- Getting harassed by undercover state police officer
- Learned where the broken meters are so we can park for free

Conclusion: Future Work

- Data collection has Concluded (50 man hours of data collection)
- Run our data in R

- Regression of Variables
- Basic confidence intervals to provide insight and answers to our questions
- Signing up for Meeting of the minds
- Real world implications/results

If there is time..



An extension of possible technological advances in the way commuters park and pay to park on campus