

May 13 - 17

Senior Design Project Plan

Group May 13-17

Group Members:

Eric Cheatham, Michael Flagg, Intae Kim, James Sampica, David Turner

Table of Contents:

[1. Project Brief](#)

May 13 - 17

- [1.1 Introduction](#)
- [1.2 Purpose Statement](#)
- [1.3 Client](#)
- [2. Project Contact Details](#)
 - [2.1 Group Members](#)
 - [2.2 Client](#)
 - [2.3 Advisor](#)
- [3. Work Plan](#)
- [4. Block Diagram](#)
- [5. Assumptions](#)
 - [5.1 User Assumptions](#)
 - [5.2 Project Assumptions](#)
- [6. Requirements](#)
 - [6.1 Functional Requirements](#)
 - [6.2 Non-functional Requirements](#)
- [7. Specifications](#)
- [8. Risks and Mitigation](#)
- [9. Project Schedule](#)

1. Project Brief

1.1 Introduction

Drivers on Iowa State University's campus are often subjected to what they perceive to be an unfair ticketing process when parking their vehicle for short periods of time. This perception

May 13 - 17

stems from the difficulty, non-uniformity, and expense of monitoring and handling parking violations on a large campus. Currently, the task of monitoring parking lots is accomplished largely by hand, utilizing expensive handheld mobile devices and a large student employment operation.

1.2 Purpose Statement

The purpose of this project is to address the cost and perceived unfairness in the current parking lot monitoring process. The project seeks to design an automated system of centrally controlled remote lot monitors to address the above issues. In addition to designing a small scale system, this project is intended to assess the viability of scaling the system to a campus sized deployment and identify what steps would have to be taken to achieve a deployment of that size.

1.3 Client

Josh Mandich/Venture Lights

2. Project Contact Details

2.1 Group Members

Member	Email	Phone #
Eric Cheatham	ejcheat@iastate.edu	(757) 243-4772
Michael Flagg	mflagg@iastate.edu	(515) 984-0122
Intae Kim	intae@iastate.edu	(515) 708-1820
James Sampica	jtsampica@gmail.com	
David Turner	djturner@iastate.edu	(515) 201-0790

2.2 Client

Name	Email	Phone #
Josh Mandich	jmandich@iastate.edu	(612) 875-1395

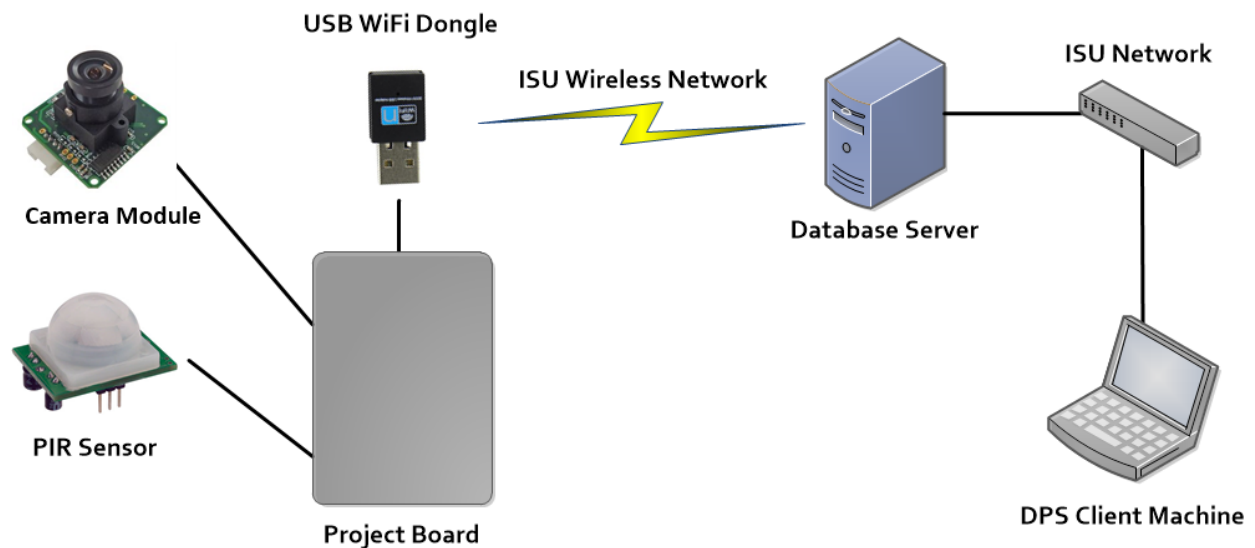
2.3 Advisor

Name	Email	Phone #
Arun Somani	arun@iastate.edu	(515) 294-0442

3. Work Plan

Name/ Role	Task
Eric Cheatham - Team Lead	- Communication between remote devices and central server - Assist in development of server user interface
Michael Flagg - Lead Research	- Multi-environment condition image capture - Motion detection via image analysis
Intae Kim - Assistant Research	-Hardware Integration -Non-image based motion detection
James Sampica -Webmaster	- Central server/database creation and securing - Development of user interface for server
David Turner - Recorder	- Optical Character Recognition on captured images - Image compression for network transmission

4. Block Diagram



5. Assumptions

5.1 User Assumptions

- The most common user will be a university's parking management or Department of Public Safety.

5.2 Project Assumptions

- The client will cover development costs up to \$800 during the project period.

6. Requirements

6.1 Functional Requirements

- Take reliable pictures of passing cars
- Image processing must be completed in less than 20 seconds.
- Operate on pre-existing wireless networks
- Communication between remote devices and central server should be secure
- Communication between remote devices and central server should not be hampered by platform differences
- Operational regardless of time of day
- Operate in inclement weather
- Be able to deal with multi-entry lots

6.2 Non-functional Requirements

- Availability
 - Price per unit
 - Source code available on request
 - Design Documents available upon request
- Network Interoperability
 - Must be able to work on pre-existing networks without any infrastructure modification
- Reliability
- Scalability
 - Solution must be implemented in a way that allows for expansion of pre-existing solution deployments
- Security
 - Communication between remote devices and central server will be secured as to prevent unwanted data proliferation from attackers
- Supportability
- Usability
 - Deployed solution should require, at most, an hour of training to be able to use the solution

7. Specifications

- Temperature
 - -40°C - 85°C
- Dimensions
 - < 0.5 cubic feet
- Weight
 - < 3lbs

May 13 - 17

- Voltage source
 - 5V/700mA
- Waterproof/Weatherproof
 - Snow/rain/sleet/hail

May 13 - 17

8. Risks and Mitigation

As with all large projects, there are certain risks involved that could affect its outcome. Many of these risks may be mitigated through detailed planning and in-depth testing. Some possible risks are outlined below.

Risks

- Reliability of open source libraries
- Image processing algorithm
- Hardware availability and reliability
- Character and Image encoding methods vary drastically between C and Java based applications
- Third party licensing considerations (LGPLv3 vs. BSD Licenses)

Mitigation

- In-depth testing of libraries to ensure required functionality is present. If not, then research possible library swap to get required functionality
- Establish relationship to hardware provider through email to ensure hardware is on schedule for release and shipment
- Establish multiple means of contact and have regular contact
- Use of Lesser GPL v3 license to allow for the greatest level of license compatibility

9. Project Schedule

Week	Task	Artifact Due
Week 1 8/19/12	Select project	
Week 2 8/26/12	Meet with client, advisor	
Weeks 3-4 9/2/12	Initial research, market research	
Weeks 5-6 9/18/12	More focused research, platform selection, project plan	Project Plan - First Draft
Week 7 9/30/12	Finalize requirements with the client	
Weeks 8-10 10/7/12	Work on design document, begin testing and prototyping	Design Doc - First Draft
Weeks 11-12 10/28/12	Work on second draft of the project plan, start work on group presentation	Project Plan - Second Draft

May 13 - 17

Weeks 13-15 11/11/12	Finish design document, project plan and work on group presentation	Design Doc and Project Plan - Final Draft
Week 16 12/2/12	Finish group presentation	Group Presentation