# KNIGHT WATCH SECURITY (KWS)
Initial Project and Group Identification Document

Fall 2012

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# I. Project Description

A reliable, home security system has been desired by humankind since the dawn of time. While many homes throughout the world have implemented various designs for home security, very few homes use an energy efficient system. Energy efficient home security system will ease the daily struggles with safety, security, and finances. In addition, previous security systems have limited connectivity. With today's technology and society's "Go Green" outlook, many homes and families should have a desire to implement a home security system that is dependable, energy efficient, and easy to use. With a system like this, homeowners will be able to live their daily lives reassured that their personal assets are kept safe in a resourceful manner. They would also be satisfied knowing this system was simple to implement as well as user friendly.

In order to provide homes with a better sense of protection and a more versatile structure, we are proposing Knight Watch Security (KWS). KWS is an autonomous, solar-powered security system camera with network capabilities. Our goal is to build a self-contained security camera that people will feel comfortable and satisfied installing outside of their homes.

Our security camera will be mounted on a pole that can be placed anywhere outside the user's home. The camera will have a wide viewing angle and Wi-Fi connectivity with a specific range, so the location of the camera is up to the user's discretion. The system will be powered using state of the art solar panels. Furthermore, the video being recorded will be transmitted via Wi-Fi to a specified computer and can be stored as well as viewed live. Similarly, the video feed will be able to be viewed from a Smartphone using an application that can stream the video feed.

# II. Impact on Energy

We are striving to optimize the power output of our solar camera with maximum power point tracking and AGM battery. Taking our camera system off the grid allows for a more versatile and sustainable system. Out system will provide a crucial video link where grid power may not be available. We are investing in a high output low power consumption processor and WIFI radio. Our project is completely scalable and can be customized to fit many different applications. Thank you for considering our project for sponsorship.

# III. Project Specifications and Requirements

a.) Solar-Sufficient (no outside power consumed):
   i. <u>Supply:</u> 40W Solar PV panel
   ii. <u>Storage:</u> Internal battery
   iii. <u>Data transmission (Router):</u> 9.6W (12 Volt, 800mA)
   iv. <u>Video feed system:</u> 9W (Max.)

b.) Solar powered:
   i. PV panel 40W (Dimensions undetermined).
   ii. Panel dimensions will be based upon power requirements.
   iii. Unit's housing will incorporate our panel design.

c.) Internal battery:
   i. Small application deep-cycle gel cell 12V.
   ii. Power storage ability for 24 hours of self-sufficient function.
   iii. At least one year of battery use before replacement.

d.) Interface capabilities:
   i. Remote desktop access.
   ii. Remote smartphone access (Android App).
      1. On/Off control.
      2. Zoom capabilities (Analog/Digital comb.).
      3. Default mode

e.) Portable (Fully wireless operation):
   i. Solar powered, with power storage ability.
   ii. Wi-Fi data transmission capabilities (20m range).
   iii. Self-contained (weather resistant housing).
   iv. Lightweight (under 25lbs.).

f.) Pan and tilt adjustments:
   i. Pan – Unit can be manually rotated horizontally through 180° of vision.
   ii. Tilt – Vertical adjustment has $45°$ of freedom.
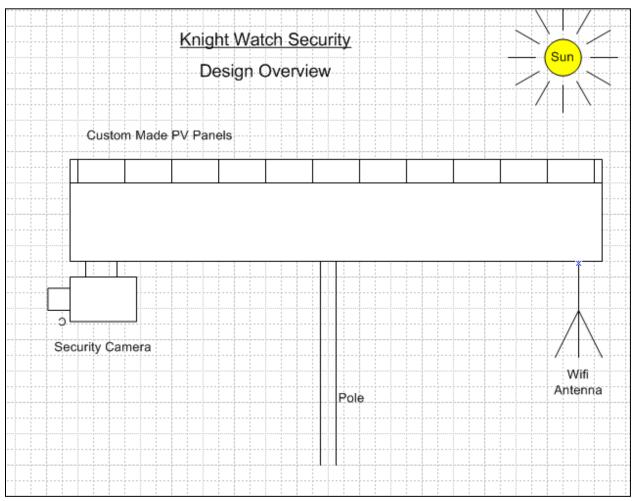
# IV.  Project Block Diagrams
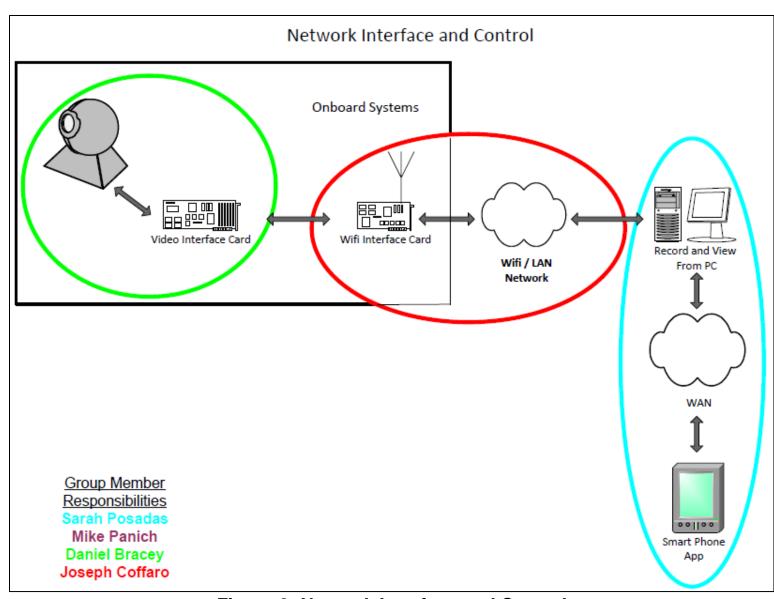


Figure 1: Design Overview

# Network Interface and Control

## Onboard Systems

Video Interface Card

Wifi Interface Card

**Wifi / LAN Network**

Record and View From PC

**WAN**

Smart Phone App

Group Member
Responsibilities
Sarah Posadas
Mike Panich
Daniel Bracey
Joseph Coffaro

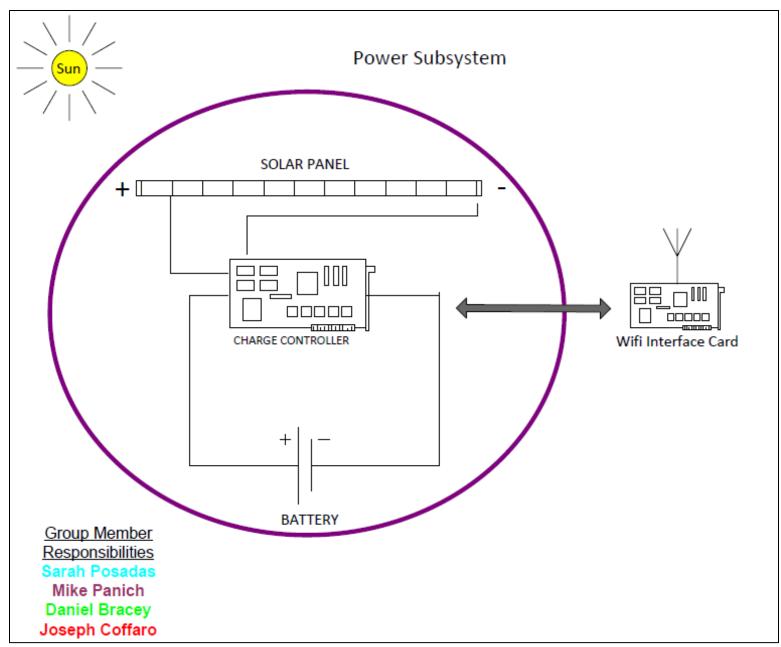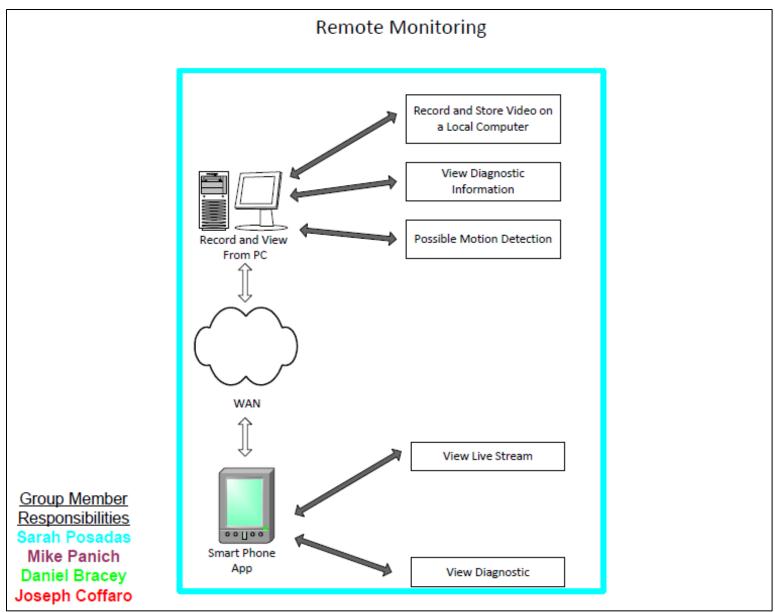**Figure 2: Network Interface and Control**

**Figure 3: Power Subsystem**

**Figure 4: Remote Monitoring**

# V. Project Budget and Financing

(All costs are estimated and subject to change)

| Knight Watch Budget | | |
|---|---|---|
| **Part** | **Part #** | **Price** |
| Logitech Webcam | C500 | $ 79.99 |
| NPower 40 Watt Amorphous Solar Panel | 24559 | $ 199.99 |
| AGM Battery - 12V 55Ah | 40740 | $ 123.96 |
| AM335x Starter Kit | TMDSSK3358 | $ 199.00 |
| Processor For PCB | ARM-335x | $ 99.99 |
| Wifi Shell | RN-121 | $ 79.00 |
| Wifi Antenna | 12433921 | $ 19.95 |
| Wireless router | WNDR3400-100NAS | $ 79.99 |
| Printed Circuit Board (2) Camera/Com | | $ 148.95 |
| Housing | | $ 85.50 |
| Wires and Terminals | | $ 15.99 |

| **MPPT Charge Controller Itemization** | | | ↓ | ↓ |
|---|---|---|---|---|
| **Part** | **Qty** | **Price/unit (USD)** | | |
| Printed Circuit Board | 2 | $ 74.48 | $ | 148.95 |
| Capacitors | 70 | $ 0.10 | $ | 7.00 |
| Resistors | 125 | $ 0.10 | $ | 12.50 |
| Inductors | 10 | $ 0.14 | $ | 1.40 |
| MOSFETs/Transistors | 20 | $ 0.63 | $ | 12.60 |
| Diodes/Rectifiers | 20 | $ 0.20 | $ | 4.00 |
| Fuse Holders | 5 | $ 2.38 | $ | 2.38 |
| Pitch Connectors | 15 | $ 2.00 | $ | 30.06 |
| NTC | 1 | $ 0.39 | $ | 0.39 |
| Op Amps | 10 | $ 1.05 | $ | 10.54 |
| Switching Regulator | 1 | $ 0.76 | $ | 0.76 |
| Current Monitor | 1 | $ 3.03 | $ | 3.03 |
| Logic Gates | 5 | $ 0.23 | $ | 1.16 |
| MPPT IC | 1 | $ 9.98 | $ | 9.98 |
| Crystal Oscillator | 1 | $ 1.12 | $ | 1.12 |
| | | Total | | $1,378.18 |

# VI.  Project Milestones

**Fall 2012**

|  | Task Name | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Finalize project idea | X | | | | | | | |
| 2 | Get idea approved and find a sponsor | X | | | | | | | |
| 3 | Research video subsystem module | X | X | X | | | | | |
| 4 | Research networking subsystem module | X | X | X | | | | | |
| 5 | Research software development module | X | X | X | | | | | |
| 6 | Research power subsystem module | X | X | X | | | | | |
| 7 | Research how to integrate each subsystem into one | | X | X | | | | | |
| 8 | Research parts (price, specs, etc.) | | X | X | | | | | |
| 9 | Finalize expected design | | | X | X | | | | |
| 10 | Finalize semester project report | | | X | X | | | | |

**Spring 2013**

|  | Task Name | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Review and Confirm Designs | | | | | X | | | |
| 2 | Order and Receive Parts | | | | | X | | | |
| 3 | Build and test video subsystem module | | | | | X | X | X | |
| 4 | Build and test networking subsystem module | | | | | X | X | X | |
| 5 | Build and test software development module | | | | | X | X | X | |
| 6 | Build and test power subsystem module | | | | | X | X | X | |
| 7 | Combine all modules | | | | | | X | X | X |
| 8 | Verify and test combined system | | | | | | X | X | X |
| 9 | Modify system to resolve issues | | | | | | X | X | X |
| 10 | Finalize combined system | | | | | | | X | X |
| 11 | Prepare final presentation and present | | | | | | | X | X |