

Final Report

Sensor and Mounting System for Security and Surveillance Applications

ENGR 498B Spring 2008

University of Arizona

K & A Wireless

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2 Scope

In this report the design process for the project “*Sensor and Mounting System for Security and Surveillance Application*” will be accounted for. This report is broken down into five different main sections. Each main section corresponds to major design review in the design process. In each main section there is a recurring subsection “*Earn Value Management System EVMS*” corresponding to the team and project’s performance during the design process. Also as any continuous projects its technical requirements are in flow and not completely set in stone prior to a final design. For this project the “*Technical Requirements Document TRD*” subsection is repeated in some main sections.

3 System Requirements and Concept Review SRR/CR

In this review the team had to meet with the sponsor of the project so in order to explain what the project’s requirements are. These requirements will be discussed in further sections. Furthermore the team has to start drafting supporting and administrative documentation. This documentation will be discussed in this section’s subsections. This review was presented in mid September 2007.

3.1 Sponsor Contract

A contract between the sponsor and the team was drafted to outline the terms and conditions on the work to be done in the project. Among the highlight of the sponsor contract were the provision that the contract would become void at the end of the completion of the project. Another clause indicated that the sponsor would provide the team with additional material that was beyond the originally planed budget, namely the use of thermal imager. Prior to the sponsor contracts there is also a team contract, which outlined the teams mode of operation and each team member’s titles and job position within the team.

3.2 Work Breakdown Structure WBS

The Work Breakdown Structure WBS is the scheduling of the different task and jobs that the team members and the team as a whole had to accomplish for each design review. The WBS was first drafted at the beginning of the project and implemented in the EVMS. The WBS was never updated after that. Among the highlights of the WBS were the creation of supporting and administrative documentation and the task to keep them up-to-date.

3.3 Earn Value Management System EVMS

The Earn Value Management system EVMS is an excel spreadsheet that keeps that team's and the individual team members performance in a graphical way. The EVMS works by first inputting the work schedule for the duration of the project and the amount of hours each team member will have to work and the actual work done on individual tasks and jobs. Also the EVMS serve as tool to determine if the project is behind, on, or ahead of schedule, based on the work done by the team. Furthermore the EVMS can determine if the project is over or under budget based on the calculated spending done by the completion of a given task. For more information refer to EVMS_G1.

3.4 Statement of Work SOW

The Statement of Work SOW was drafted based on the general template. For this project the SOW outline what the sponsor expected of the team with some concessions. Among the concession in the SOW, were that the project would be a proof of concept rather than a final product. This first draft of the SOW only had the initial idea that both the sponsor and the team has on the project in the final version of the SOW the actual work done by the team will be stated. For more information refer to SOW_1.1

3.5 Technical Requirements Document TRD

The Technical Requirements Document TRD like its name state is document similar to the SOW, with the difference that the TRD has all of the desired values for the different components for the project. Among the requirements in the first draft of the TRD were: A windows based application for video processing and mount control; rate of self-induced motion for video processing algorithm; detachable and

weather proofed imager housing; transmission of video data through TCP/IP. For more information refer to TRD_1.1

3.6 Concepts

The initial concepts for this lab were as simple as just hanging the imager housing to spring to as complex as having a six degrees of control freedom mount. Figures 1 – 4 show different mount concepts.

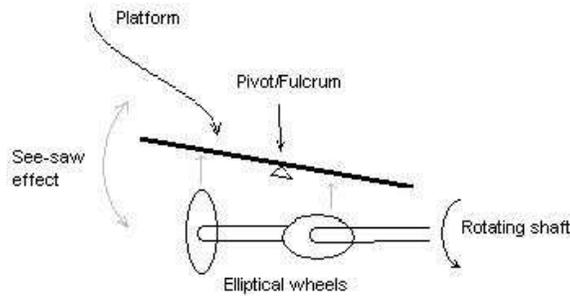


Figure 1

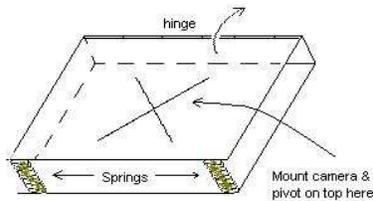


Figure 2

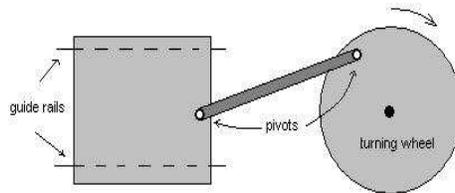


Figure 3

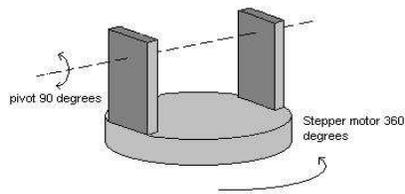


Figure 4

4 Preliminary Design Review PDR

This review consisted mainly of updating the TRD, EVMS documents; furthermore trade studies for different components were done. This design review was originally prepared and planned for mid to late October 2007, but was actually presented at the end of November 2007.

4.1 Trade Studies

The trade studies for this project consisted of the three established major components: camera housing, camera mount, and software tradeoffs.

4.1.1 Camera Housing

The Trade study for the camera housing consisted of selecting if a generic weather proofed or a custom made camera housing were the best choice for the project. In the end of the project the camera housing was dismissed after the restructuring of the project done in the following design review.

4.1.2 Camera Mount

Like the camera housing trade study it consisted of selecting a readily available camera mount or to build a custom made mount. The selected camera mount was a readily available camera mount with properties prescribed by the TRD and the addition of an RS-232 communication port.

4.1.3 Software

The software trade study consisted on comparing popular and obscure internet transmission of information and control protocols. Among the selected software aspects were: Ethernet communication using a UDP protocol.

4.2 Long Leads

Long leads were items that would require a longer time to get to the team after the project budget was approved. For this project the only long lead was the camera mount; this was because the cost of the selected mount was beyond the project budget, and negotiation between the sponsor, supplier and team to bring down the cost of the mount took time.

4.3 Earn Value Management System EVMS

As mention before the EVMS was the only document that is continuously updated. This is because the EVMS keeps track of the project and team member's performance. For this design review the both the project and team performance were on the same level to the budgeted work fro the project, making the project to be on schedule. For more information refer to EVMS_G2.

4.4 Technical Requirements Documents Flow-Downs TRD

Along with the EVMS the TRD is updated with every design review up until the Critical Design Review CDR. For this review the TRD was updated with the projects sub-systems flow-downs. As mention in the trade studies section by this design review the project consisted of three major sub-systems: Camera unit, Mount, and Network/Software. The camera unit was consisting of the camera imagers and the analog wireless transmitters. The mount sub-system was composed of the mount, control interface and the terminal server that converts RS-232 to Ethernet. The network/software was made up of the analog video receiver, the video digitizer (VTRIX), and the internet network interface (router). For more information refer to TRD_2_2b.

4.5 Preliminary Test Plan

This design review required the team to draft a test plan for the project. Among the test elements were the mount control protocol; wireless communication

of transmitter/receivers; and the different software components. For more information refer to TestPlan.

4.6 Preliminary Design Concept

Based on the concepts that were presented in the System Requirements and Concept Review SRR/CR, the main concepts that was selected was the use of a camera mount that would allow the camera housing to be detachable and transmit the camera video signals to the base station at the bottom of the mount via wireless transmitter/receivers. Also in the base station the VTRIX would be located and connected to the Ethernet router, which would connect to the network.

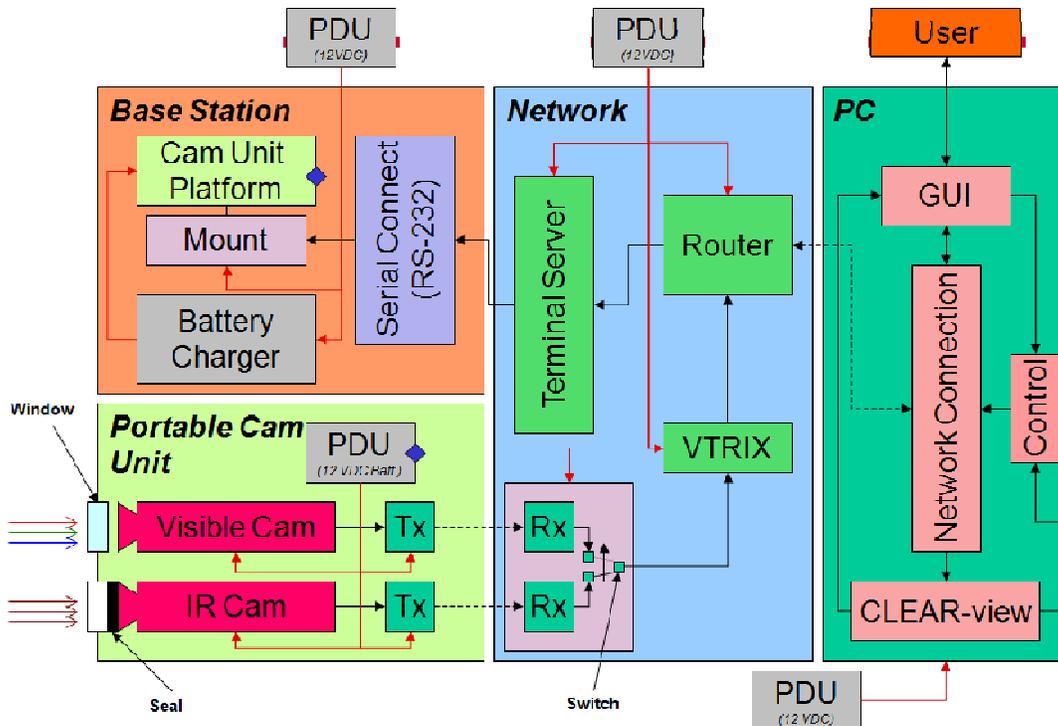


Figure 5

5 Critical Design Review CDR

In this particular gate the team was supposed to continue its design as scheduled and as outlined by the SOW. However, given that the equipment that the sponsor provided for the project was inadequate the team decided to restructure the whole project. This was successfully negotiated with the sponsor and the project was restructured to be more efficient than it was originally planned. Instead of having a windows based application to control video processing and mount control, the team

offer to do this in a java environment that is available in almost any network enable computer. This review was planed to be presented before the end of the fall 2007 semester, but due to the restructuring of the project the review was presented in mid march 2008. This review was essential to the project

5.1 Earn Value Management System EVMS

As in the previous design reviews the EVMS was updated wit the work done by each team member. By this point the team decided that the task planed prior to the project restructure would remain the same in the EVMS. For more information refer to EVMS_G3.

5.2 Software Design Documents SDD

This review was also characterized by having Software Design Documents SDD, since the whole project has now become a manly software implementation project. For more information refer to SDD_3.1.

5.3 Test Plans

Following the test plan draft presented in the Preliminary Design Review PDR, the final test plan mostly included software test. For more information refer to BLT_Test_Plan_3.

5.4 Final Technical Requirements Documents TRD

As previously mention the project was restructure in to a more software oriented project, therefore the TRD had to be rewritten to reflect the software requirements. For more information refer to TRD_3_2.

5.5 Final Statement of Work SOW

Just like the TRD, the SOW had to be rewritten to outline the new restructure project. For more information refer to SOW_3.2.

6 Project Review

This review consists of presenting the test procedures and to give an update of the remaining items of the project. This review was to be presented at the beginning of the spring 2008 semester but due to various circumstances it was presented two weeks after the Critical Design Review CDR, by the end of March 2008.

6.1 Earn Value Management System EVMS

Like the other review this one was no different by having the EVMS updated. There was not much of a difference between the EVMS sum from CDR and this review. For more information refer to EVMS_G4.

6.2 Test Procedures

Unlike a test plan, which outlines when and what is to be tested, a test procedure is the outline of the steps and explains the how a test need to b performed. For more information refer to: BLT_test_procedure_4, TestProcedure_VideoProcessor, and TestProcedure_VideoStreamApplet.

7 Final Review / Design Day

7.1 Test Results

For more information refer to Test_Results.

7.2 Design Day