

University of Central Florida

Department of Electrical & Computer
Engineering

EEL 4914
Senior Design



QwikCam

Divide and Conquer v1.0

Design Project

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January 21, 2021

Topic - Project Narrative

In the United States alone there are over 25,000 high school and junior programs. Extracurricular activities such as school sponsored sports and athletics make up a significant experience to millions of students and their families every year. Whether it be through direct contact and participation of an individual or the commitment of the family to come and support those that are participating. Being able to record, stream, and access footage of these athletics are crucial to many different clients and personnel in the junior athletic world. This can range from family members out of state wanting to tune in for a Friday night football game of their family member to a coach wanting to record the play on a soccer pitch to show his players later on in practice sessions what can be approved upon.

Qwikcut is a video and analytics company based in the central Florida area that is contracted to go to high school athletics such as Football games, Soccer matches, lacrosse matches, etc and their objective is to record, stream, and relay these games in real time from their current camera and tripod setup. This recording and live streaming can be used for some of the examples listed in the above sections and gives the customer a great service in filming these events. The Qwikcut current setup coincides with a 25' tall tripod that is mounted with a Bescor motorized head with a Sony handycam and three cables used for streaming.

However, over the years that Qwikcut has been operating they have found their tripod and camera setup to be less than adequate to handle the needs of the company and have been running into some issues that need to be addressed. The current setup as listed above has problems with its three cables system in which these cables are always needing to be replaced which is a great expense, the motorized head that is used at the top of tripod does not pan fast enough for sports and uses 4- AA batteries as a power unit, and the HDMI that is currently used does not carry audio while streaming the video. Along with these design issues another big issue comes from the fact that Florida's weather does not always give the company perfect conditions to film in, especially when the current equipment is not waterproof. In order to solve these downfalls Qwikcut has called upon us to improve upon their current setup and design a new filming tripod that they call the Qwikcam.

Qwikcam will improve upon all aspects of the previous design in that it will feature more adequate and updated technology that can be used to better serve Qwikcut themselves but also their customers. The system will comprise of a Pan-Tilt-Zoom (PTZ) camera that will be housed in a waterproof container that will run via either a singular USB 3 or CAT 5 cable that will run to a computer to be recorded and streamed in real time. This PTZ camera will be able to stream in at least 1920x1080 clarity and will be able to be controlled by a wired game controller connected to the computer.

The goal for our customer is to create a portable, lightweight, and overall simple system that can be taken to a wide variety of schools, athletic events, and locations around the central Florida area and be used by the Qwikcut team in order to make their recording and streaming of games as efficient and easy as possible.

Motivation

There are many things we can look at while watching game film that can be very useful for both the student and the coach. These films are meant to be a very important part of moving from the highschool level to the collegiate level in many cases. In the quest of trying to reach that level, it's well known that using game film lets you become your own coach in a way and see things that may be too hard to explain. It provides players a means of reflection with an opportunity to notice the other teams or their own strengths and weaknesses. When players can see first hand and recognize a role they can improve on, they become much harder to overcome.

In our group, we have either seen, shot, or edited a game film at some point in time and we see there are things that can be improved on as well as problems that need to be fixed. We feel like the issues Qwikcut has expressed to us, when fixed, can make the world of a difference in the eyes of a student trying to up their game, a coach or even a prospect trying to get more information which can then turn this into a make or break moment.

As a group it was exciting to think of the improvements we can make along with how this idea can be brought to the next level of convenience, with streaming being a large portion of media consumed today, we are streaming more than ever. This is due to the newer forms of entertainment being brought about and with an even bigger obstacle we face every day now with COVID-19. Living with the virus today has made most of us uncertain with how big groups will gather in the future and streaming has been a big part of that.

With all these factors in mind, we felt like this was a project that was perfect for our group to tackle. We feel that we can take the needs and requirements from Qwikcut and deliver on something all parties can be proud of at the end of the day. Below we can also see the setup that Qwikcut is working with so we can get an idea of devices and requirements we must use to make this project a reality.





Requirements

Going off the previous build and tripod for Qwikcut the new and improved qwikcam will need to be able to meet the specifications of our sponsor. This project will fulfill the following requirements:

- Use a Pan-Tilt-Zoom (PTZ) camera that PoE (Power over Ethernet) capable
- Would need to be easily mounted to the current 25' tripods that Qwikcut uses
- Use only 1 cable to run down to a laptop, possibly USB 3 or CAT 5
- PTZ camera would need to be able to be run by a game controller connected to the computer
- Video needs to be stored on either an SD card in the computer or internal hard drive or both
- This system/build will need to be waterproof as well

Possible extra requirements or alterations we could add:

- Wireless communications system from the computer to the camera, no wired connection
- Motorized system to build onto tripod to lift the system into the air up to the 25' requirement
- Possibly multiple cameras around to be switched to remotely.

		Panning Speed	Quality of Video	Battery Life	Weight	Target
		+	+	+	-	
Panning Speed	+		↓	↓	↓	Full Field In 10 seconds
Quality of Video	+	↓		↓↓	↓↓	1080P
Battery Life	+	↓	↓↓		↓↓	8-10 Hours
Weight	-	↓	↓↓	↓↓		Minimal

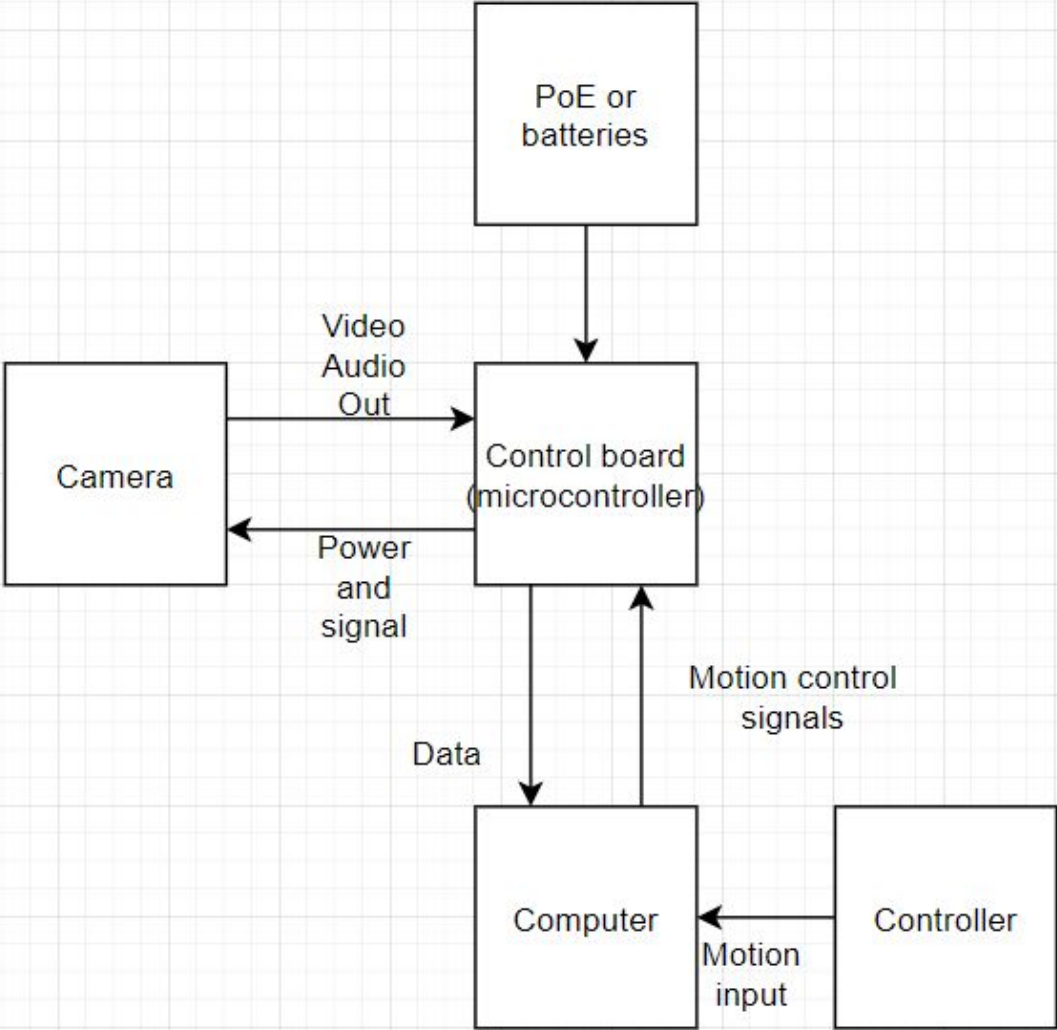
Constraints:

Here is a list of desired constraints and some to be determined from our group and sponsor:

<u>Part Required</u>	<u>Specification and Type</u>
Tripod	<ul style="list-style-type: none"> • At least 20' Tall
Camera	<ul style="list-style-type: none"> • Capable of 1920x1080 quality or higher • 360 degree viewing angle • Zoom capability of at least 100 yards • PoE powered • Waterproof • Programmable
FPGA/Microcontroller	<ul style="list-style-type: none"> • At least 12V power • Wireless communication
Computer	<ul style="list-style-type: none"> • Specs to be determined by Qwikcut sponsor
Controller	<ul style="list-style-type: none"> • Wired, 360 degree motion control
Microphone	<ul style="list-style-type: none"> • PoE powered, range of at least 50 yards
Possible container	<ul style="list-style-type: none"> • Weight less than 15lbs
SD Card	<ul style="list-style-type: none"> • At least 64 GB

Block Diagram

This section will divide portions of our project into respective sections that will be researched and looked into by our group members.



Budget and Financing

The table listed below lists all needed parts and aspects of this project at the moment with a minor description of the part along with a price. Quantity and suppliers are also listed but will need to be altered and added to as the semester and project moves on as there are a few aspects of the project and design still up in the air. A more definitive price and overall quantity will be determined at a future date. Some parts and pieces will be provided by our sponsor at Qwikcut and we will still need to determine if this project will be fully funded by our sponsor as well or if there will need to be some financial responsibility from the group members as well.

<u>Part</u>	<u>Part Description</u>	<u>Quantity</u>	<u>Price (\$USD)</u>	<u>Supplier</u>
Housing unit	Waterproof containment apparatus	1-2	30-70	TBD
PTZ Camera	Camera to be used in the filming	1-2	200-300	TBD
Tripod	Tripod the system needs to be mounted upon	1-2	0	Qwikcut
PCB Board	Board to power the PoE camera	1-2	20-80	TBD
Game controller	Controller to control the movement of the PTZ camera	1-2	30-50	TBD
Cable	USB 3 or CAT 5 cable to be connected to the computer and the camera	1-2	5-15	TBD
Batteries	External batteries to power PCB board or PTZ camera	1-4	10-20	TBD
Computer	Computer to operate and controller the camera from	1-2	0	Qwikcut
Power adapter	Dc to PoE converter	1-2	15-25	TBD
Microphone	Used to pick up audio along with the PTZ camera	1	20-40	TBD
SD Card	SD card to download and store the video from the PTZ camera	1-2	10-12	TBD
		<u>Total Price:</u>	330-612	

Project Milestone

This section will detail and lay out the basic groundwork for how our group is going to research, prototype, and build our final project at the end of the summer 21 semester.

<u>Objective</u>	<u>Semester</u>	<u>Start date</u>	<u>End Date</u>	<u>Status</u>
Senior design idea generation	Spring 21	1/11/21	1/18/21	Completed
Confirmation of project	Spring 21	1/19/21	1/22/21	Completed
D&C V1	Spring 21	1/23/21	1/27/21	Completed
Meeting with professor Richie	Spring 21	2/2/21	2/2/21	Has not occurred yet
D&C V2	Spring 21	2/3/12	2/12/21	In Progress
Respective research for all 4 members	Spring 21	2/13/21	3/19/21	In Progress
60 Page Draft	Spring 21	3/19/21	4/2/21	In Progress
100 Page Draft	Spring 21	4/3/21	4/16/21	In Progress
120 Page- Final Documentation	Spring 21	4/17/21	4/27/21	In Progress
Final meeting with sponsor to confirm ideas before building	Summer 21	4/29/21	4/29/21	Has not occurred yet
Order components	Summer 21	TBD	TBD	
Initial building and testing	Summer 21	TBD	TBD	
Build Prototype	Summer 21	TBD	TBD	
Test and Debug	Summer 21	TBD	TBD	
Redesign if needed	Summer 21	TBD	TBD	
Final Documentation senior design 2	Summer 21	TBD	TBD	
Finalize project	Summer 21	TBD	TBD	