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EEL 4914 Electrical Engineering Design

Project Design Report:
Equine Dental Camera

Abstract:

Equine Dentistry is normally provided in a rustic setting such as a stable or barn where horses are lightly tranquilized and restrained in the standing position as dental work is provide. Restraints do not impede the over excited horse from flailing and causing damage in the immediate area. The possible violent reaction of the horse coupled with the rustic features of location prevents the Veterinarian Technician from placing expensive computer and electronic equipment in close proximity to the horse. However, there is an ever growing need to document, by digital photography, the dental disposition before and after service. Thus, this project consists of building an equine dental camera in the likeness of a gun with a mirror mounted to the top of the body and a camera on the end for inspecting the horse's teeth. Non native lighting will be provided by microprocessor driven pulse wave modulated LED's varied in intensity by user input into the microprocessor. The images from the camera will be displayed on a color LCD screen mounted on the back of the gun and will also be wirelessly transmitted to a distant laptop via RF transmitters. There will be streaming video, as well as an option to capture screen shots.

Table of Contents

Features:

The equine dental camera provides the equestrian dental industry with a new product that incorporates inspecting and documenting dental procedures. The following features will be incorporated in the product:

- 380 line resolution camera mounted at an angle.
- Archaic mirror mounted on the top of the camera shaft.
- Integrated color LCD screen in the handle.
- Adjustable brightness for the camera's LED's.
- Wireless video transmission to a laptop.
- Screen capture button, as well as streaming video.

Components:

To be able to provide the features listed above, the following parts in table 1 will be required:

Component	Cost	Use
Camera	$134	Capture video and still shots
RF Transmitter/ Receiver	$87	Wireless transmission of video

Push Buttons	Free	power and capture features
LED's	Free	Lighting for camera
Potentiometer	Free	To adjust LED brightness
Microprocessor	Free	Drive LED's and capture function
Color LCD	$75	View from camera

Table 1

The camera that has been chosen has a resolution of 380 lines. There are cameras available with higher resolutions, however for this design the video being captured is close to the camera lens and 380 will be plenty of resolution. The cost is also cheaper for less resolution.

The RF transmitter and receiver pair chosen will accommodate our bandwidth and has a good range. There are models available with a larger range, however the distance between the individual and the laptop should not be greater than 50 feet.

The push buttons are generic buttons used for turning power on and off and another button for activating a still shot. There are many different types, but the easy choice is the free one.

The LED’s incorporated into the camera housing only need to illuminate the local region where the camera is being used. The LED system needs to be dark enough that it doesn’t white out the camera feed. There are many different options for LED’s, but the white ones available in lab have the right brightness.

There are many choices for the potentiometer. Many different ones could be implemented since it is only being used as a voltage divider. There is an abundant supply in the lab of different sizes.

At least one microprocessor will be used in the project. If there is going to be more than one, they will be the same type of microprocessor. The microprocessor will be used to monitor the voltage at the potentiometer and adjust the pulse width modulation driving the LED’s. It will also be used to transmit a signal to the laptop to take a screen shot when the button is pressed.

The color LCD will be mounted into the handle and will display the streaming video from the camera. The LCD being implemented will need to have the correct video input type and be slim enough to mount into the handle. Many other LCD screens are available, but it has to meet the specifications listed to be easily integrated into the project.

Figure 1 shows the initial design.

Figure1

Technical Concepts:

There are several technical objectives that must be overcome to produce a competitive product into the equine dentistry industry. The unit has size constraints, durability issues, minimum operating time, and user functionality.

First, the unit must be small enough to fit into the horse’s mouth. It must be able to reach to the back of the mouth and produce quality video of the teeth. The unit has to be thick enough to incorporate the mirror and camera as well. To achieve this, the unit will need to be between 0.75 and 1.5 inches thick. The end will also be tapered to allow it to reach to the rear of the mouth.

The next challenge will be making the unit durable enough to be used in the rustic surroundings of a barn or out in the fields. The unit will have to be waterproof since it

will be used in the mouth of the horse. To achieve this goal, the mirror and camera housing will be sealed and the unit will be built as thick as possible. The thickness will help to make the unit more rigid and durable.

The third challenge will be maintaining a minimum operating time. The unit will need to be able to last for the entire time it takes to examine the horse. To overcome this problem, the equine dental camera will be implementing a 12V lead acid battery power supply. The unit will have to have a voltage regulator to step down the voltage for the microprocessor though.

The final challenge is functionality. The user will need to be able to operate the unit with one hand. All controls and functions will have to be readily available at one's finger tips. To accomplish this, the push buttons for power and capturing images will be implemented by way of a two trigger design. The potentiometer will be accessible by the thumb on the rear of the handle.

The Competition:

There are not any products available for the equine industry, but there is for the human dentistry field. Our product should be less than this and built with the equine industry in mind. Figure 2 shows the human type.

#AIC888 / #AIC900
AdvanceCAM Intraoral Camera (wireless)

- camera weights only 2 ounces
- high resolution, auto focus
- view image in full or quad screen
- 3 hours of operation before recharging
- four independent wireless channels
- high, medium and low power indicator (LED)
- 8"L x 1'W x 1.25" H

#AIC900
Wireless Transmitter (included)

- 2.4 GHz, 8.5V charger
- LED channel indicator
- 2.0" x 1.0"

$1,650 To order, please phone us for an individual consultation to determine which combination of components best fits your needs

Figure 2

Labor Division:

Table 2 shows the tasks at hand and the individual who is responsible for that task. However, the project is a team effort and both team members will be working on all tasks.

Task Name	Point Person
Introduction	Gene
Research/ Project proposal	Josh
Research/ Order Parts	Gene
Develop Code	Josh
Build/ Check Circuitry	Gene
Build Gun Casing	Gene

Mount Camera and Circuitry	Gene
Integrate All Components	Josh
Troubleshoot	Josh
Demo	Josh

Table 2

Timeline:

Table 3 shows the predicted timeline for the project. It will be updated throughout the semester to reflect the progress being made.

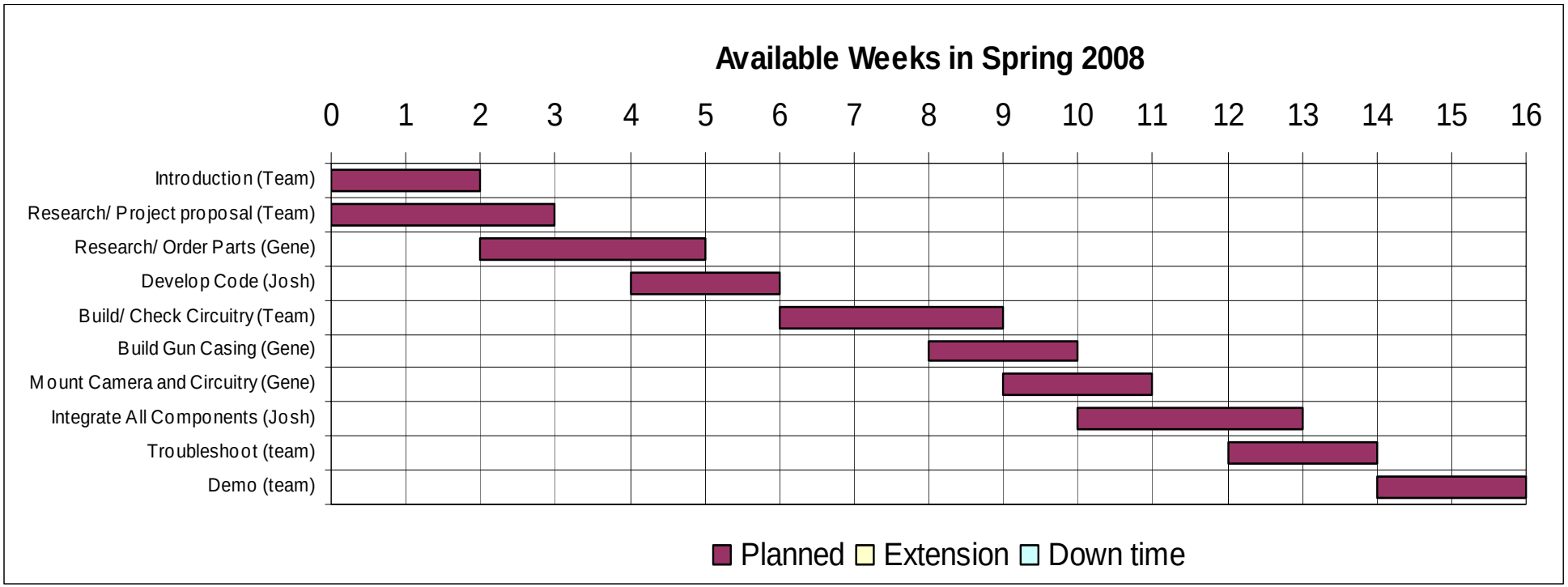

Table 3