Smart Whiteboard Eraser

ECE 186A - Senior Design I
Fall 2018 - Dr. Stillmaker

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Project Manager: Heather Libecki _____

Team Member: Chris Quesada _____

Team Member: Juan Colin _____

Technical Advisor: Dr. Kulhandjian _____

I. INTRODUCTION

Our project, the Smart Eraser, is an automatic whiteboard eraser. The main deliverable of this project will be an eraser which can move left-to-right on a track, and up-and-down on a bar attached to the track. This eraser will be able to automatically detect on a whiteboard where there are markings through the use of a camera and image-detection programming. The camera will send the coordinates of the markings to the eraser, which will then find the quickest route to erase the markings, before returning to itsâĂŹ stand-by position. The eraser will also be able to detect the presence of a person, resulting in the immediate termination of whatever process it was carrying out. Heather Libecki is responsible for being the project manager, the wireless communication between the camera and the imbedded system, and she will also be contributing to the completion of the image-processing program which will detect where the markings on the board are. Chris Quesada is responsible for developing the micro-controller code, particularly the physical movement protocols of the system, using the coordinates specified by the camera, and he will also be contributing to the completion of the image-processing program which will detect if a person is in front of the board. Juan Colin is responsible for the creation and execution of the physical, mechanical system that the eraser will be attached to, including the wiring of the system itself, and he will also be contributing to the research and implementation of the power system. All three of the team members will assist each other with the initial research, then break off into their own specialties as the project completion progresses.

II. BACKGROUND

The main goal of this project is to create a fully-functional automatic eraser that detects where it needs to erase as well as if there is a person in front of the board. The following objectives will need to be accomplished in order to obtain this goal: design a track system for the eraser, design a power system for the track, design a control panel/interface, create a compact unit that can easily be moved on the track, create an image-processing program in Matlab, create the path/coordinate system for the eraser to follow, communicate the created path to the Raspberry Pi, and detect if a person is standing in front of the board. The following list contains the strengths and weaknesses that were found for each member of the group. Heather Libecki Strengths: programming (assembly, Matlab), mathematics, debugging, circuit implementation, problem solving, technical writing, public speaking Weaknesses: programming (verilog, Python), circuitry design, coding algorithms, power systems, Github Chris Quesada Strengths: programming (assembly, verilog, Matlab) embedded systems, algorithms, brainstorming Weaknesses: programming (Python), circuitry design, mathematics, Github, public speaking Juan Colin Strengths: electrical systems, circuitry design, problem solving, power systems, problem solving, public speaking/relations Weaknesses: programming (assembly, verilog, Matlab, Python), Github, technical writing and spelling The background information that

will need to be researched in order to implement this project is: image-processing programs, translating data from image-processing into coordinates, wireless communication between separate devices, Simulink in Matlab, Github repositories, Python usage, connecting physical devices for the track of the eraser, language and usage of Raspberry Pi, and other research as necessary. The specific courses that this group has taken that will be used in the implementation of this project are: Embedded Systems (ECE 178), Introduction to Electrical and Computer Engineering Tools (ECE 72), Computer Networks (ECE 146), Principles of Electrical Circuits (ECE 90), Micro-processor Architecture and Programming (ECE 118), Digital Logic Design (ECE 85), and Switching Theory and Logical Design (ECE 106).

III. PROJECT DESCRIPTION

The Smart Eraser will use a microcontroller to process images obtained through communication with a camera in order to detect where markings are on a whiteboard. The coordinates of the marks will be detected through the aforementioned image-processing, which will determine where the eraser moves on the whiteboard. There will also be a separate protocol which will detect if there is a person standing in front of the board. The major components that may potentially be needed for this project are in the following list (prices listed are a rough estimate based on preliminary internet research). Standard Eraser $(3) Standard Whiteboard (40)$ Stepper motors $(60 x 2) H - bridge (2)$ Microcontrollers: Raspberry Pi $(35) HD Camera (largely varying) Metal roller track, mounting system$

REFERENCES