

ECE4011/ECE 4012 Project Summary

Project Title	CDC Cognitive Testing Platform for Nonhuman Primates
Team Members (names and majors)	Collin Moore, EE
	Jonathan Proctor, CmpE
	Ashwin Ramanathan, EE
	Samuel Yeomans, CmpE
	Nathan Zavanelli, EE
Advisor / Section	Linda Milor/A05
Semester	Spring 2018 Intermediate (ECE4011)
Project Abstract (250-300 words)	<p>The CDC Cognitive Testing Platform Team will re-design a cognitive testing platform for nonhuman primates for the CDC. Currently, the system uses an obsolete Windows-based computer. Dr. James Weed has requested that we redesign it using a newer, cost-effective embedded system such as a Raspberry Pi. The platform must allow at minimum a monkey to manipulate a joystick through the bars of its cage and receive banana pellets using a feeding apparatus for correctly interacting with the system. The monkey receives the pellets through correct responses to a Visual Basic GUI test platform running on the Windows computer. Presently, due to the size of the pellets, this mechanism often gets jammed up or dispenses an incorrect number of pellets. At minimum, the team could just replace the computer and integrate the current joystick, feeding system, and Visual Basic testing code. However, the team could potentially redesign the whole platform using a modern, 5VDC stepper motor for the feeding apparatus and a modern HDMI compatible monitor. Dr. Weed has also mentioned the possibility of expanding the test platform to include use cases for other animals. Weighing these options and considering the needs and logistical restrictions of entering and exiting the CDC, the team has decided to obsolete the entire system and redesign the code base, mechanical components and macro-level circuitry from the ground-up, as opposed to integrating the older legacy systems. While this will raise the cost of our project, this decision will ensure that the platform we create is reliable, future-proof, and easily repairable and expandable without technical interference.</p>

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List codes and standards that significantly affect your project. Briefly describe how they influenced your design.	In order to successfully complete this project, there are several essential standards that must be met. First, we must adhere to the Center for Disease Control's standards on animal safety and ethics. Specifically, we will need to consider the ways in which the platform interacts with, and potentially harms, the monkey subjects. Second, HID compliance standards will be important in coordinating setup of the platform. Finally, the CDC has strong security standards which must be met.
List at least two significant realistic design constraints that applied to your project. Briefly describe how they affected your design.	<p>Because of the nature of the lab, our testing apparatus must be attachable to the cages the animals are kept in. This puts certain sizing constraints on our design which will impact the decisions we make on what devices to include inside the apparatus. Lighter and smaller devices will be required for this solution.</p> <p>After use, the testing apparatus must be disinfected per lab policy. This will put a constraint on our design when considering materials used to encase the apparatus. Additionally, we must make sure the electronics of the apparatus are either resistant to the cleaning methods or consider additional materials to protect them.</p>
Briefly explain two significant trade-offs considered in your design, including options considered and the solution chosen.	<p>Existing Visual Basic vs Python: Python has massive library support for the Raspberry Pi and building simple GUIs. However, the CDC has existing Visual Basic code, which may save time during development at the cost of performance. The chosen solution is to rewrite the platform in Python.</p> <p>Modularity vs specificity: It's possible the CDC may use this system to interact with a wider variety of animals than primates. This consideration is not a requirement of the project, but it would add to the system's functionality and expand the CDC's usability to more use cases. Considering the focus is on enhancing the current platform for primates, the team has chosen to not include support for this feature.</p>
<p>Briefly describe the computing aspects of your projects, specifically identifying hardware-software tradeoffs, interfaces, and/or interactions.</p> <p><i>Complete if applicable; required if team includes CmpE majors.</i></p>	<p>The project requires the use of a Raspberry Pi, which has limited processing power, but is priced at a very reasonable \$30. Python's Raspberry Pi GPIO libraries are somewhat limited, but development in Python can be deployed quickly. Considering that this system does not need to meet any real-time constraints, these hardware limitations are very reasonable and should produce a desirable outcome.</p>

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<p>Leadership Roles (ECE4011 & Forecasted for ECE4012) (NOTE: ECE4012 requires definition of additional leadership roles including:</p> <ol style="list-style-type: none"> 1. Webmaster 2. Expo coordinator 3. Documentation 	<p>Webmaster: Samuel Yeomans Expo coordinator: Jonathan Procter Documentation: Samuel Yeomans CDC coordinator: Ashwin Ramanathan Hardware team leader: Nathan Zavanelli Software team leader: Collin Moore</p>
<p>International Program: Global Issues (Less than one page) (Only teams with one or more International Program participants need to complete this section)</p>	