Spring 5-1-2017

Hardware Design Theory (using Raspberry Pi)

Anthony Kelly
kellya12@student.lasalle.edu

Thomas Blum Dr.
La Salle University, blum@lasalle.edu

PROPOSAL | UNDERGRADUATE RESEARCH | RASPBERRY PI DESIGN AND IMPLEMENTATION

The concept for this research proposal is focused on achieving three main objectives:

1) To understand the logic and design behind the Raspberry Pi (RbP) mini-computer model, including: all hardware components and their functions, the capabilities [and limits] of the RbP, and the circuit engineering for these components.
2) To be able to, using the Python high-level language, duplicate, manipulate, and create RbP projects ranging from basic user-input and response systems to the theories behind more intricate and complicated observatory sensors.
3) Simultaneously, in order to combine a mutual shared interest of History and to blend in work done within my History minor, we will be looking into a number of written works and also have in-person discussions focused on the history of computing, and briefly (and from a broad perspective) examining the effects of computing and technology as they grew from individual components to complex systems.

This work will be done, in conjunction, by Dr. Thomas Blum of the Department of Mathematics and Computer Science, and by Anthony Kelly, Information Technology major within the Department of Mathematics and Computer Science.

Due to the circumstance that La Salle offers neither a Computer Hardware Design course nor a Python Programming course, the initial stage of the course will consist of getting up to speed on both fronts.

The research itself will consist of three phases:

1) Phase I will consist of learning the components of the RbP system, and by replicating a number of existing projects to better understand the intricacies of the computer and to obtain a better grasp of the Python language.
2) Phase II will involve modifying project parameters and physical components to achieve auxiliary tasks and goals as jointly determined.
3) Phase III will include the development and implementation of our own projects.

The research will include:

1) Programming Assignments
    a. Done using the Python language (primary language of the RbP)
2) Hardware modifications (either physical or virtualized)
    a. Some boards have components that are removal / modifiable, otherwise, it can be simulated using software such as Multisim.
3) Short essay / summary of a historical book
    a. Currently in discussion, presently looking at one of two options:
        i. The Chip – T.R. Reid
        ii. The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution – Walter Isaacson (author of Steve Jobs)
4) Discussion or Presentation on Results
    a. Possibly to the department in Colloquium fashion
    b. During required research presentation