Teaching Logic Gates Through Student Centered Investigation of Video Game Controllers

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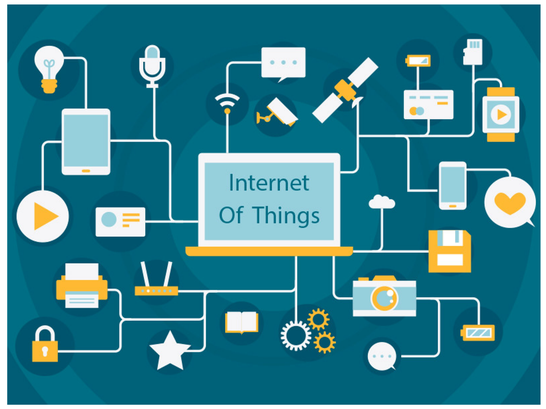
Summary

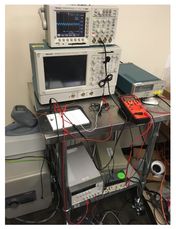
RET Site: Collaborative Multidisciplinary Engineering Design Experiences for Teachers (CoMET)

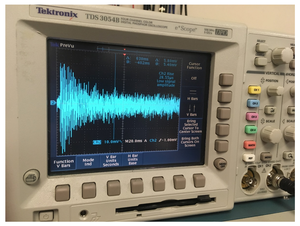
Internet of Things (IoT)

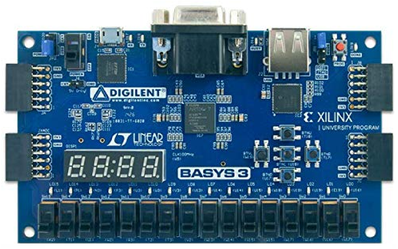


The Internet of Things (IoT) is the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data. During this program we researched the design process of sensors and how hardware and software are designed to work with both the sensors and networking.

Research Activities







MEMS Sensors
- Frequency Sensor
- Temperature Sensor

Hardware Platform Module
- Basys3 Field Programmable Gate Array programmed in Vivado
- Logic Gates
- Lookup Tables
- JAVA Programming

Software and Networking
- Networking layers
- OSI Model
- Secruirty and Privacy Issues
- Raspberry Pi

Mobile Programming
- Android Programming
- Linux Programming
- Raspberry Pi Programming

Lesson Plan

Day 1: Pre-Test and NES Controller Disassembly
- Give students pretest
- Separate students into groups of no more than four
- Give students NES controller and phillips head screwdriver
- Tell students to carefully disassemble the controller and when they are done write down as a group how they think the controller works, for example how the system understands that a button was pushed.

Day 2: Introduction to Logic Operators (And, Or, Not, and Truth Tables)
- Briefly review the previous day and ask different groups how they think the NES remote worked.
- Discuss how button presses complete a circuit and effect Voltage, Current, and Resistance
- Tell the class that today we will be learning about the logic operators that make this controller work
- Show power point on logic operators and truth tables
- Give examples to work with the class to answer
- Give examples for the students to work together on
- Give examples for the students to work independently on
- Ask students again how the controller works. Work with students to arrive at a diagram of how the buttons and d-pad work.
- Give students participation quiz on logic gates

Day 3: Students Design their own Remote Based on Video Game Genre
- Tell students that you want them to think of a video game genre and design a controller for that specific genre
- Students will work in groups of no more than four
- Draw the remote on paper and write the logic gates and logic tables for the controller
- Give students participation quiz on logic gates

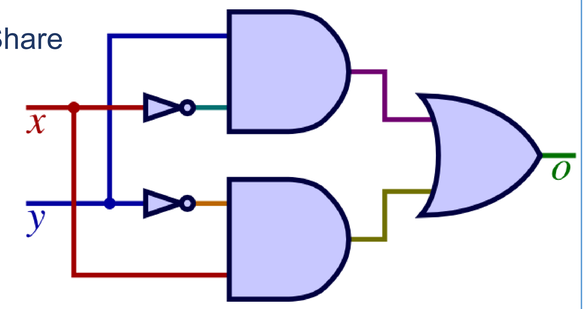
Day 4: Students Present their Controllers
- Have the student groups present their controllers to the class
- Give students post test

Lessons Learned

- Students will understand logic gates and truth tables
- Students will be able to create a logic circuit based on known inputs and wanted outputs

Implementation Strategy

- Think, Pair, Share
- Scaffolding



Acknowledgments

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