Unit 4.1: Introduction to State Machines

Content Area: **Science**
Course(s): **Digital Electro**
Time Period: **Semester 2**
Length: **3 weeks**
Status: **Published**

Standards

TEC.9-12.8.1.12.B	Creativity and Innovation
TEC.9-12.8.1.12.F	Critical Thinking, Problem Solving, and Decision Making

Enduring Understandings

Understandings

Students will understand that ...

1. A state machine is a circuit design that sequences through a set of predetermined states controlled by a clock and other input signals.
2. A state machine is designed through the creation of a state graph and a state transition table.
3. State machines can be implemented using small and medium scale integrated gates and programmable logic devices.
4. State machines are used to control common everyday devices such as elevator doors, traffic lights, and combinational (electronics) locks.
5. There are many sensor inputs and outputs other than LEDs and seven-segment displays in real world systems.

Essential Questions

Students will keep considering ...

1. Why are state machine designs used in electronics?
2. What are the common components of a state machine and how are they arranged to make state transitions based on inputs?
3. What are some common everyday devices that are controlled by state machines?

Knowledge and Skills

Knowledge

Students will ...

1. Understand the basic function of a state machine.
2. Identify the parts of a state graph and a state transition table.
3. Recognize a state machine and identify examples of a state machine.
4. Recognize a wide range of sensor inputs and outputs in real-word systems.

Skills

Students will …

1. Describe the components of a state machine.
2. Draw a state graph and construct a state transition table for a state machine.
3. Derive a state machine's Boolean equations from its state transition table.
4. Implement Boolean equations into a functional state machine.
5. Use Circuit Design Software (CDS) and a PLD to simulate and prototype state machine designs implemented with discrete and programmable logic.

Assessments

https://docs.google.com/document/d/1wR7bQF-8AQoRrt0g4C3hKja0yjwDjC9_BiAmONWbTcI/edit?usp=sharing

Modifications

https://docs.google.com/document/d/1ODqaPP69YkcFiyG72fIT8XsUIe3K1VSG7nxuc4CpCec/edit?usp=sharing

Resources

Technology Resources

- National Instruments Multiim circuit design and simulation software
- Microsoft Office Applications

Electronics Resources

- Electronics Trainers (power supply, function generator, breadboard)
- Electronics hand tools (diagonal cutters, needle-nosed pliers, wire strippers, etc.)
- Digital Multimeters
- Digital Transistor-Transistor Logic (TTL) integrated circuits
- TTL Chip Checker
- Dual Channel Oscilloscope
- Digital/Analog Function Generator