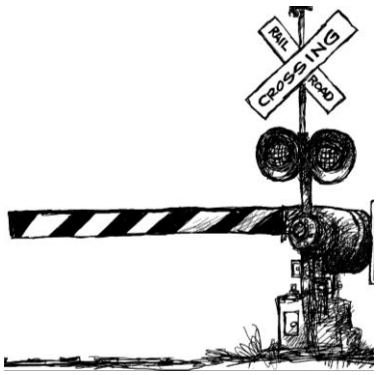
PATH 2

Step 1:

Go to
http://www.ionaphysics.org/lobby/robotics/classroom/outline/StandardServoIntroAndProgram.docx

and follow the tutorial on the standard servo. After following that tutorial you should be able to answer questions like the following:

1. What is a standard servo?
2. How does it work?
3. How do you program it?



Engineering problem: The Railroad Crossing.

1. Watch this video and note that there are three things operating at an automated railroad grade crossing: sound, lights, and gate.

https://www.youtube.com/watch?v=cIVU64iswUM

You should have seen that the lights and sound start first. They operate on different cycle times, the sounds cycling on and off at a higher frequency than the flashing of the lights. After a brief delay the gate starts coming down.

After the train has completely passed the crossing the gates begin to move up. There is a slight delay before the sounds and flashing lights stop.

So, this is your next project:

Input:

- Use a pushbutton to indicate the approach of the train.
- You will hold the button down for as long as the train is present.

Output:

- Two RED LEDs flash alternately at a frequency of 1 Hz beginning when the button is first pushed.
- The beeper beeps with a 50% duty cycle 2 times each second beginning when the button is first pushed.
- The gate begins to descend 5 seconds after the button is pushed.
- The gate begins to go up as soon as the button is released.
- The red LEDs and the beeper stop 5 seconds after the button is released.

Build the necessary circuits and program your microcontroller to operate a grade crossing.

This link shows a different way of managing a grade crossing. What are the advantages and disadvantages of this approach? https://www.youtube.com/watch?v=jnN7oPLIkuI

Additional Information:

These are actual numbers taken from the newspaper after a bad crossing accident:

- Lights start to flash at least 20 seconds before the train arrives.
- Lights must flash for at least three seconds before the gates start to come down.
- Gates must be horizontal for at least five seconds before the train arrives.
- New York law mandates that drivers stop at least 15 feet from the nearest rail.
- If traffic is bad you should never enter the track area unless there is room ahead to clear it.
- Never drive around lowered gates.
- If you find yourself caught between the gates, stay in your car and barrel through the gates, which are made of fiberglass and designed to break off when hit.
- Run at a 45 degree angle in the direction of the train, away from the crossing.