**Arduino - based Automatic Level Crossing (on a budget!)**

This small project describes an automatic level crossing system controlling 4 UK style Level Crossing Gates, 2 signals (one for the down track and one for the up track) using one “Arduino Nano” (< £9 including terminals) – and 8 LDR sensors in the track (~ 10p each) and 4 small servo motors (<£1 each). The 3D printed parts including the holding base and gates cost <£2.

Our layout has a lower level which is DCC controlled with twin tracks with a station in the middle and a level crossing next to it, and both tracks are fitted with two 3 aspect signals with sensors placed immediately after each signal. The other 2 sensors per track are placed just before and just after the fiddle yards for each circuit – see the simplified schematic below. The outer loop direction is clockwise, the inner loop anticlockwise.

Diagram

Description automatically generated

This project runs on an Arduino Nano with eight LDR based sensors distributed along a double track railway with the old style Level Crossing gates and a station at the centre. The sensors detect a train entering the section from either side with at least 1 metre of track (n-gauge - more needed for OO or O gauge) to the level crossing gates - this allows time for the servo controlled gates to close in sequence (exit gates last) to road traffic and open to Train traffic. The sensor for leaving the section is also >1metre away so that long trains will be clear of the gates before opening to road traffic. Trains entering simultaneously on each track will not trigger the gates to open for road traffic until both have exited the section. Additionally there is a two aspect signal at the exit to the station which changes to green when then the gates are open for train traffic and changes to red again immediately after being triggered by the train leaving the platform. All the sensor data is sent to a computer running JMRI using a CMRI USB connection - the serial.print lines are commented out when CMRI is running - and are active only when debugging the hardware.

Traffic is only permitted in one direction for each line, so that the software is only triggered in the correct sequence - this reduces the chance of spurious triggering and "switch bounce".

The gate mechanism is 3D printed comprising a base which holds 4 servo motors so that the spindles are vertical, a top plate to the base unit to hold in place the spindle extensions into which the Level Crossing Gates engage with a friction fit so that in the case of a train crashing into gates still closed to Trains, little damage will be caused. By default the gates are closed to Trains, and close to traffic in the sequence that moves the left gates first and the right gates last to enable cars on the crossing to exit without hitting the gates.

The Arduino sketch is shown at the GitHub repository under https://github.com/StephenWR/Model-Railway-Automatic-Level-Crossing-and-signals

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The Arduino Nano with terminal block

A circuit board

Description automatically generated

IR sensor module with 5mm Tx/Rx diodes.

(For n-gauge replace with 3mm diodes)

A circuit board

Description automatically generated