Build a Signalling System for Trains

Project 2.05

Train tracks can get quite complicated. Tracks cross over one another, join together and split apart. When you have more than one train on these complex track systems, how do you prevent the trains from crashing into each other? The answer is **signalling**! In this worksheet you will add signalling to your train system so that trains can be controlled to avoid crashes.

How it Works

You will build a signalling system using a separate Microbit. Attached to the Microbit will be a **break-beam** sensor. The break-beam sensor consists of an infra-red LED and an infra-red sensor, set up so the LED faces the sensor. When the sensor sees the LED beam it will send a digital 1 value to the Microbit. But if something passes in front of the beam, the sensor cannot detect the beam and the sensor sends a digital 0 to the Microbit.



So in this way your signal Microbit will be able to detect the presence of a train. The signal Microbit will send messages to the train microbits telling them when they can move and when they can't.



What to do

- You will need to work in a team of 2 to get this project working! One of you will be responsible for the signalling, and the other will be responsible for the train.
- If you haven't already done so, build the train by referring to the previous worksheet (just build it, don't code it).
- Follow the instructions in this worksheet to build the signalling system
- Code the signalling system and train so they communicate with each other
- Finally, attempt the code challenges to improve your signalling and possible add a third train.

Assemble the Signalling System



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Code the Signal 1



Make the train move when button A is pressed

Now add some code that when the A button on the controller is pressed, it sends a message to the train, asking it to move forwards.



Code the Signal 2

Make the train stop

Now we will add code to stop the train when the break-beam sensor is triggered.



Code the Train 1



Add the Motor Driver Extension

The motor driver extension adds code blocks that allow you to control motors.



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Code the Train 2



Now place the train on the track and press the A button on the controller. The train should move around the track until it breaks the beam.

Your Challenge!

Add a second train, called TrainB and a second break-beam sensor to the signal Microbit. Get the second train to move when button B on the signal is pressed. Arrange the trains on a track with a branch and place TrainA and TrainB on different branches. You should be able to use the buttons and signals to ensure the trains don't crash!



Super Challenge!

Using TrainA and TrainB from the above challenge, remove the code for the buttons to control the trains and make it so TrainA and TrainB take turns to move around the track on their own branch. The trains should move automatically, without human intervention!

Solutions 1

Two Trains

You will need to code the signal Microbit to send messages to TrainB and code TrainB to receive the messages from the signal Microbit.

Train B Code



Signal Code



Solutions 2

Automatic Trains

Trains will take turns to move depending on which beam sensor is triggered. The train code does not need to change, but the signal code needs to control both of them.

