STEMSEL Beginners Project 10: Bike Indicator

Problem

All road users should tell others when they are going to turn, which includes bicycles. We want to create an electronic way for bike riders to show they want to turn.

Background

As global warming becomes even more of a concern, it is important to consider ways we can cut down on greenhouse gas emissions. Although they are convenient, cars burn petrol to move and therefore emit greenhouse gases. Public transport is a little better, because you are creating less greenhouse gas per person. However, walking or cycling doesn't produce any greenhouse gas at all. For this reason, some people prefer to use bikes if they are only going a short distance, and some people ride their bike to school or work. Some roads even have special cycling lanes to give cyclists more room on the road and make it safer.

However, it is important to be careful when riding a bike on the road, since there are cars, trucks and buses on the road as well. One way to keep everyone safe is for all road users to tell each other what they are going to do. For example, if you let others know when you are going to stop or make a turn, they can then react accordingly by slowing down so they don't hit you, or go around you. On a car this is all handled by lights, specifically brake lights, reversing lights and indicators, although they also have other electronic devices to assist the driver, like parking radars and even cameras. It is also important to watch other road users so you can see these signals.

Bikes on the other hand usually don't have any electronics on them at all. To signal a turn on a bike you need to use hand signals. But what about at night, would other road users be able to see you using your hand to signal a turn? In this project we will make an electronic indicator that will go on the back of the bike and can be used both in the day and at night to make cyclists safer. See the following video for a demonstration: http://www.youtube.com/watch?v=Oc-b9Cf9Z_E.

Ideas

What components do we need to make our bike indicator? How can we show which direction we want to turn? How can we tell the microchip what direction we want to turn? How fast should the indicator lights blink? What should the microchip do if neither button is pressed?

Plan

We want to make an indicator light circuit for a bicycle. On a car, there are three colours of lights that mean different things. When the car uses the brakes, red lights come on. The indicators used to show when a car wants to turn are orange, and the reversing lights that come on when the car goes backwards are white. We will also use lights of several different colours, specifically the LEDs in our kit. By law, cyclists must have lights on their bike when riding at night, which should consist of a white light on the front and a red light on the

back. It would be pretty silly to have two sets of lights on the back of the bike, so our light should also include a flashing red light. We will also need some way for the rider to activate the different lights depending on whether they want to turn left or right. Buttons are perfect for this task, so we can use the on-board button and the one in our kits.
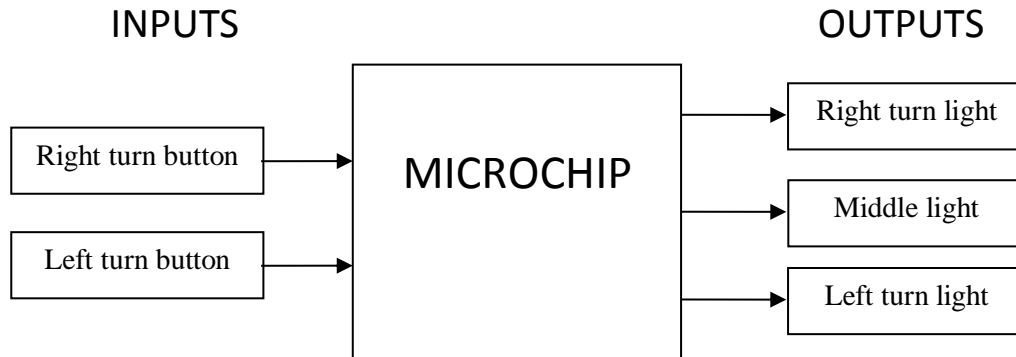

Figure 1

When turned on, the microchip should flash just the red light like a normal bike light, which will be the default mode. When either of the buttons is pressed, the red light should stay on and the appropriate turning light should flash to show the direction the rider is turning. The lights should stay like this until the button is released, at which point the indicator should return to the default mode.

Design the Circuit

Connect the components that we specified in our plan. Don't forget to right click to rename the components. If your button has bare wires instead of a three-pin connector, you will need to put it on one of the pins on the right side of the board, such as C7.
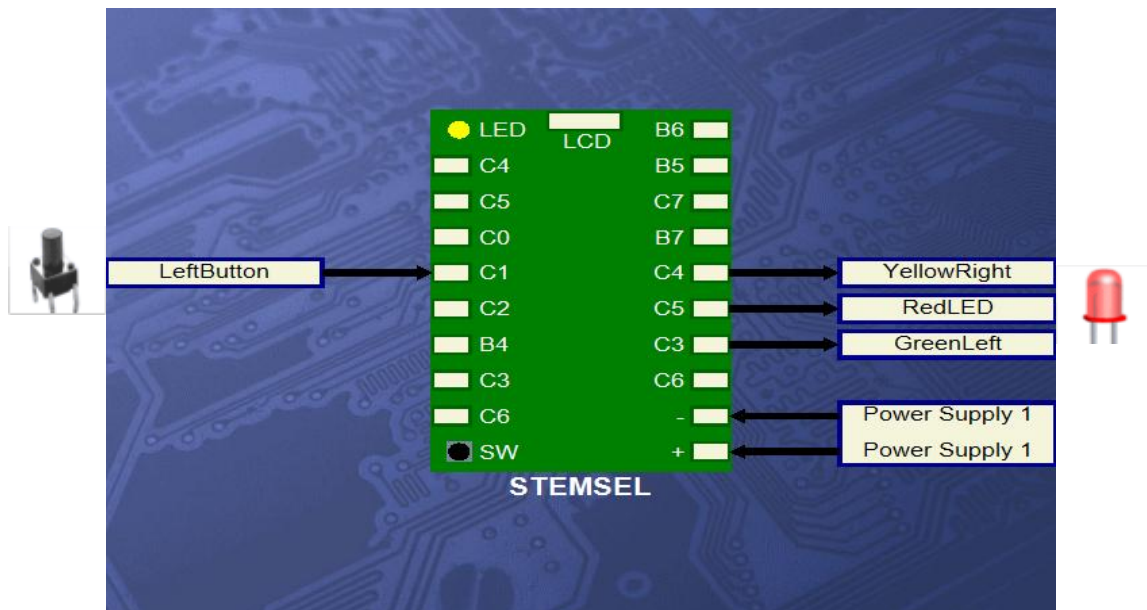

Figure 2

Build the Circuit

Use the ezCircuit Designer I/O diagram to connect the hardware. Remember the black wires go in negative, and the white wires go in the pin specified in the circuit design. If attaching the button using the three-pin connector, make sure the black wire is attached to the leftmost pin, so from left to right it would be black, red, white.
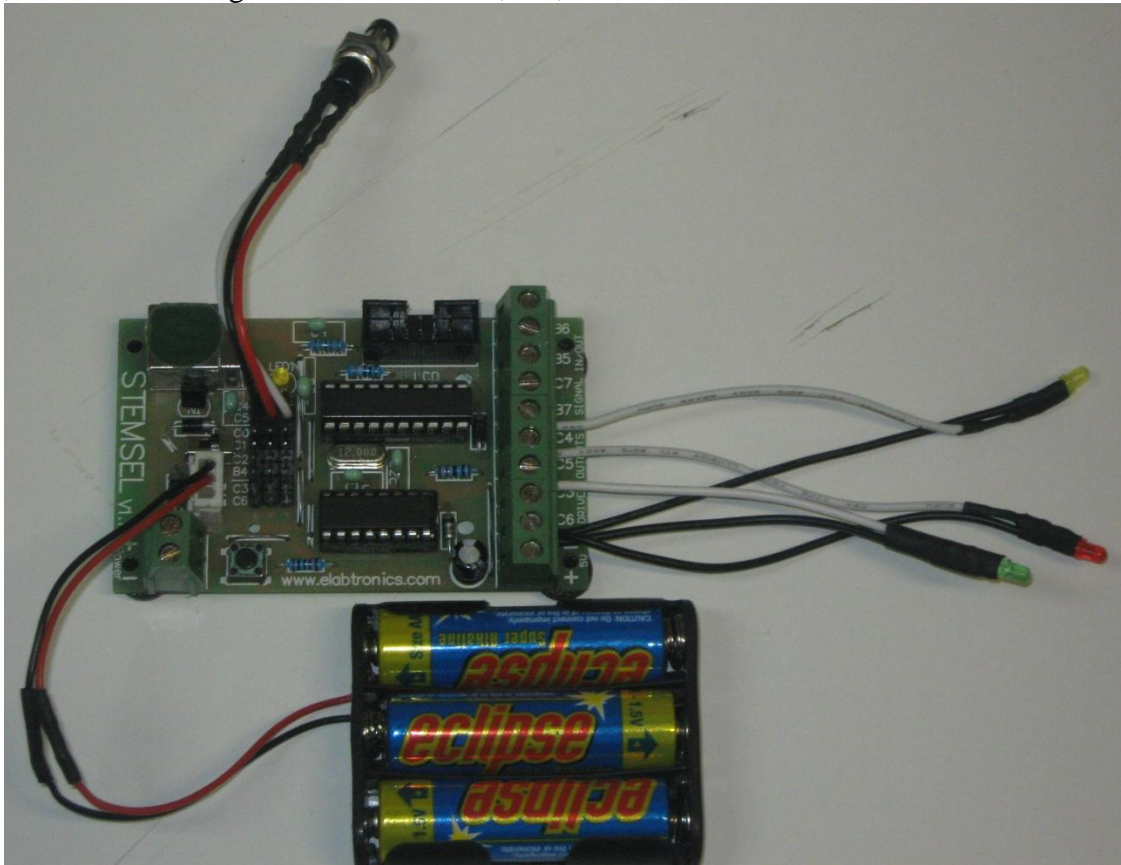

Figure 3

Programming

Use CoreChart to program the functions of the bike indicator. After you have used the test routines to check the outputs, delete them so that we can start writing our own program. According to our plan, the red light will flash by default, but if we push one of the buttons the red light should stay on and the appropriate light should flash to show which direction we are turning.

1. The default mode of our light will be just the flashing red light. Use OnOffPin and TimeDelay icons to make the RedLED flash twice a second (25 hundredths). You can copy and paste the first time delay, since we will be using 25 hundredth time delays throughout the program.

2. Next we need to check if the buttons are being pushed and activate different lights if they are. Use a Decision icon to check if LeftButton is ON, i.e. if LeftButton is pushed.

3. If it is pushed, turn on the RedLED and flash GreenLeft using delays of 25 hundredths again. Group these icons together.

4. Currently, the program will only flash the GreenLeft LED once, then continue. We want the program to stay in this group for as long as the button is pushed, just like we said in the plan. Open the group, and add another decision icon at the end to check if LeftButton is on. The default GoTo to the top the group is perfect.

5. Do the same with the right button, except using the YellowRight LED instead of GreenLeft, and the decision icons should check if A3_pushButton is Off. This will check if the on-board push button is pressed.

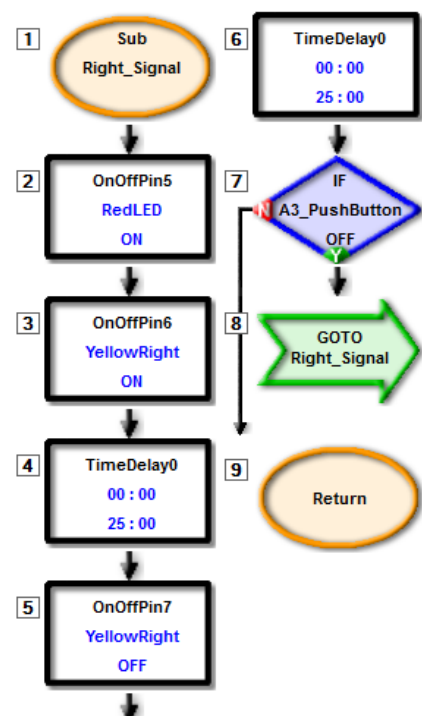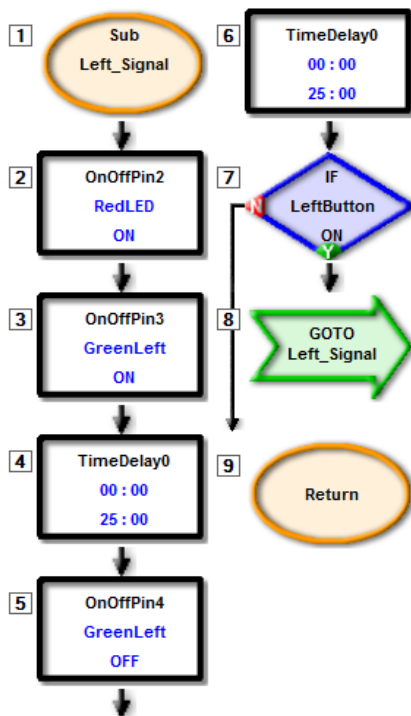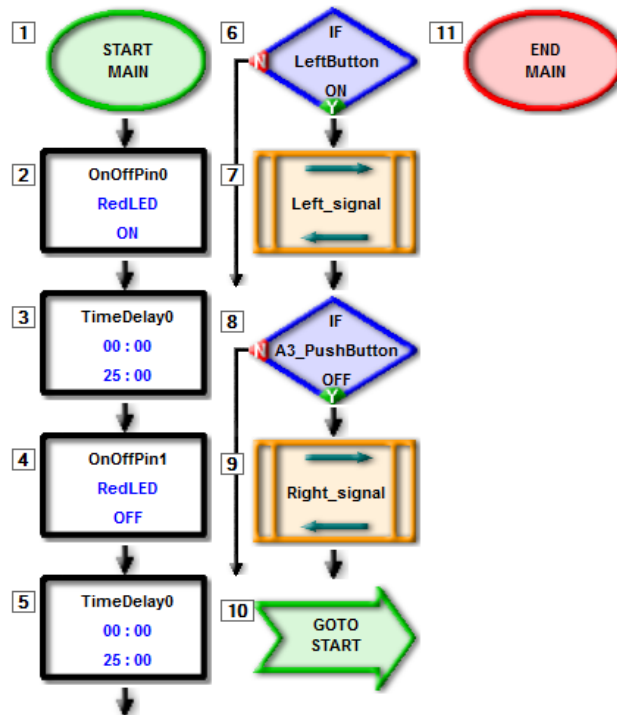6. Finally, add a GoTo Start icon at the end of the program and then send the program to chip and test it.

Figure 4

Extension

Can you add more functions to your bike indicator, for example a hazard mode where the lights all flash together to make you more visible. What about a daytime mode where the RedLED doesn't come on unless the cyclist is turning? You can even try to think of some functions of your own!

Summary

Bicycles provide a way to travel without creating any greenhouse gases. We should all take care on the road to both signal our intentions and watch other road users. This can be difficult on a bike, since you have to take your hands off the handlebars to make hand signals, which can't even be seen at night! Instead, cyclists could use indicators like the one in this project to stay safe any time they want to ride.