Project Name: **Digital Dashboard**

**Team Members:**

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**Project Abstract:**

Our project is to design a digital dashboard for a motorcycle. We will replace all the gauges (except perhaps the tachometer) with a graphical LCD. The dashboard will include standard features like a speedometer, tripometer, and odometer, as well as typical vehicle data such as engine coolant temperature. Additional features we'd like to implement would be speed control, like that found in automobiles, vehicle telemetry data, and other sensors not found on this model of motorcycle, like oil pressure and oil temperature. We'd also like to add some math-based data, like implementing a gear position indicator using vehicle speed and engine RPM, a projected instantaneous MPG rating using throttle position and an engine load parameter, and also having a user customizable tire size and sprocket ratio settings so the speedometer and odometer will continue to be accurate if the user decides to alter their motorcycle.

The design will use multiple microcontrollers, or perhaps a microcontroller/FPGA combination. If multiple microcontrollers are used, a communication scheme will need to be created, for example, so data from Speedometer module can appear on the Display Module. A host microcontroller may be used to aid communication.
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Introduction:

The digital dashboard is designed for motorcycles that do not already have one, or would like a dashboard that is easier to read, has additional features, or allows the user to correct their speedometer after installing a non-standard tire or sprockets. A few devices have been built similar to this, but I haven't seen any that have the level of user options or additional features that we would like to offer.

This dashboard is aimed more towards the enthusiast rider who would like the additional features offered; however, the benefit of building our device in a modular fashion allows some features to be left off, and thusly lowering the cost of the device.

The benefits our device offers over competitors will be the easily customizable tire size and sprocket sizing. All the user will have to do is go into the options menu, and choose common sprocket sizes from a list, and the device will automatically provide speedometer/odometer correction. Other features will include some telemetry data. This data will measure lean angle and fore/aft/lateral acceleration. Peak values will be saved and displayed, so easy comparison can by done by the rider with only a quick glance.

Another feature we'll have that most motorcycles don't is speed control. This is typically found only on higher end touring motorcycles, but for any rider who has done long distance trips, speed control is a handy feature, no matter what style motorcycle you own.

Technical Objectives:

The 2 most important design requirements include having an accurate speedometer and odometer. Care must be taken to allow these values to be as accurate as possible. Motor vehicles in the United States are allowed to have a ±5% error in speed, and vehicles in the European Union can have a tolerance of 0-+10% off (speedometer must always overrate speed).

Because a motorcycle is a small vehicle with space constraints, our device will need to be kept as small as possible, however removal of the existing dashboard will supply space, so this is not a very strict requirement.

Typically this device will be used while the vehicle's engine is running, so power will be readily available. We plan to use DC-to-DC power converters to supply power to our electronics. We will seek a power converter that allows a range on input voltages from 9V to at least 14.4V (the typical voltage range supplied by the vehicles charging system).
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Cost Objectives:

Similar models of digital dashboard replacements range from $250-$400 using a quick Google search. We would like to keep the parts cost to less than $150. The biggest cost we will incur will be the LCD display.

Materials and Resources:

We will need a graphical LCD for display. Our full design will require at least 4 microcontrollers; however because the calculation load is divided amongst all microcontrollers, we will be able to use cheaper, less powerful microcontrollers. We plan to use Atmel microcontrollers. For development, we will use the Atmel ATmega324P because of its large number of I/O ports, built in memory, and included peripherals (SPI, UART/USART, etc.); however, after the device has been designed, we may be able to use simpler equivalent microcontrollers. If the desired sensors are not already available on the motorcycle, then those sensors will need to be purchased. This will include the Hall Effect sensor, gyroscopes, accelerometers, and oil temperature/pressure.