



E-Bike STEM Education: Lesson 5: User Interface

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Rev 13Jun2017



E-Bike User Interface: What we're going to learn

- Input devices
 - Sensors
 - User Display
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- Hands On: Try out user interface scenarios on simulator ride!

User Display and Controls

- Bike trip computer features
 - Speed, Distance, Time, etc.
- eBike specific things
 - Charge remaining in battery (Ah)
 - Power going to motor (W)
 - Advanced statistics and diagnostics
- Menu and setup buttons
 - Display preferences (mph vs. kph, etc.)
 - Configure for motor, battery and input devices
- Convert or improve advanced inputs that go to motor's controller
 - Torque or pedal assist sensor, cruise control, regenerate using brake handle, etc.
 - Typically, inserted between throttle and motor-controller



eBike Throttle



- Variable output
 - Many are half-grip (similar to motorcycle)
 - Others are trigger, lever, or button
 - Typically 0.8VDC output at rest, 4.5VDC full throttle
 - Most throttles use Hall Effect sensor instead of var. resistor
- Connections (3 wires)
 - Power input: ~5.0 VDC and ground
 - Throttle output to controller



eBike Brake Handle (eBrake)

- A simple switch is built into the handle
 - When rider squeezes brake handle, switch closes
- Purposes:
 - Disables motor thrust/assist
 - Mostly for safety reasons
 - Throttle, torque sensor, and pedal assist sensor are ignored
 - Tells motor controller when to do “regenerative braking”
 - Recharges battery when going downhill or when stopping
 - Usually works only for direct drive hub motors



Pedal Assist Sensor (PAS)

- A ring of magnets on pedal crank that pass by a magnetic switch
 - Relatively inexpensive to make
 - When rider pedals, switch opens and closes
- Purposes:
 - Can use PAS for motor assist instead of throttle
 - Many eBikes don't even have a throttle!
 - Can also be used to scale up motor's assist level, when rider pedals faster



Torque Sensor



- Sensitive mechanical and electrical parts that sense force from rider's leg
 - MUCH more expensive than PAS
 - Replaces regular bike's "bottom bracket" (bearings and spindle) that pedals mount onto
- Purpose and benefit:
 - Motor and controller can quickly and accurately assist according to rider's effort
 - Rider experience is more light having very strong legs



Installing a THUN Torque Sensor for Pedelec with V3 CA

Hands on exercise



- Mount Cycle Analyst display/control unit onto donor bike
- Basic system check – signs of life?