Wheel

The electromagnet is the key component of this project. I used the only one available to me, which was a Parker Skinner Valve solenoid 24v DC. Just about any reasonably sized electromagnet should suffice for collecting data, but if you are interested in implementing this system on a bicycle you will, as we shall see, need a much larger electromagnet. In order for the electromagnet to function properly, there needs to be a ferromagnetic disc upon which the electromagnet can induce a magnetic field. The larger the disc the better. Once again, I used what was available. Specifically, I used six 20.32 cm (diameter), 1 mm thick steel discs. Since the wheel already had a disc brake rotor, I was able to drill holes in the steel discs so that they could easily attach to the hub.

After the ferromagnetic disc is set, there needs to be a way to position the electromagnet. In the case that the electromagnet is a valve solenoid, the central bolt can be secured through a hole in the frame. I used nylon spacers, washers, and a nut to secure the solenoid. The bolt was wrapped in electrical tape so that it would not slide out of the solenoid. Furthermore, a hole was drilled through its center so that another, smaller bolt could secure the solenoid onto the larger bolt.

Once the solenoid is in place, the wires can be connected to the terminal strip. Make sure the bolt is as close to the disc as possible. When I did it, the bolt was about 1mm from the disc. Any closer and the magnetic force from the bolt would cause surface contact. If it gets too close, you may want to add some cardboard or paper spacers in between the hub and the brace.

Frame

Electro-mechanical disk brakes operate via electrical actuation, but transmit torque mechanically. When electricity is applied to the coil of an electromagnet, the magnetic flux attracts the armature to the face of the brake. As it does so, it squeezes the inner and outer friction disks together.Electromagnetic braking means applying brakes using electronic and magnetic power. ... Also traditional braking systems are prone to slipping while this one is guaranteed to apply brakes to the vehicle. So without friction or need of lubrication this technology is a preferred replacement for traditional braking.

Disk electromagnetic brakes are used on vehicles such as trains, and power tools such as circular saws, to stop the blade quickly when the power is turned off.There are two kinds of service brakes, or the brakes that stop your vehicle while driving: disc and drum brakes. Additionally, almost all vehicles come with emergency brakes and anti-lock brakes.

Electric Motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque

applied on the motor's shaft. Electromagnetic brakes slow or stop motion using electromagnetic force to apply mechanical resistance. They were originally called "electro-mechanical brakes," but over the years the name changed to "electromagnetic brakes", referring to their actuation method. Motor brakes generally use friction between mating surfaces to stop or hold a load. They generate friction and braking torque in one of two ways — spring set or permanent magnet. Both methods use an electrical coil that, when voltage is applied, moves the friction faces apart to disengage the brake. When electricity is applied to the coil of an electromagnet, the magnetic flux attracts the armature to the face of the brake. As it does so, it squeezes the inner and outer friction disks together. The hub is normally mounted on the shaft that is rotating.There is no contact between braking surfaces and minimal drag.

Dynamic braking is another method for braking a motor. It is achieved by reconnecting a running motor to act as a generator immediately after it is turned off, rapidly stopping the motor. The generator action converts the mechanical energy of rotation to electrical energy that can be dissipated as heat in a resistor.

Brake torque is the force applied at the brake wheel to stop the motion of the moving equipment. Assuming the operating conditions for the equipment are con- stant, a brake having a retarding torque equal to the full load torque of the motor to which it is applied is usually satisfactory.