



## Illinois Math and Science Academy

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From the Selected Works of Gabriel Delgado

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# Microcontroller Applications Final Project Technical Manual

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**Technical Manual of**  
**L-Eye-T Product**

### ***General:***

The L-Eye-t glasses are able to track pupils using 2 QTR-1A Reflectance Sensors and an Arduino gyroscope. Each QTR-1A Reflectance Sensor is composed of an infrared (IR) LED and 2 phototransistors. Energy, in the form of electro radiation, is received from the IR LED to the phototransistors where they then sense this electro radiation (change in light levels due to the change in heat from the eye) and alter the current to the Arduino Uno correspondingly.

### ***Pupil Tracking:***

The QTR-1A Reflectance Sensors are used to track the horizontal movement of the pupil, while the Arduino gyroscope is used to track vertical/diagonal movement. The gyroscope receives its data through its analog pins from the phototransistors in the Reflectance Sensors via a breadboard since all of this data is being put into a circuit, ultimately connecting to an Arduino Uno. A gyroscope is used in place of simply 4 Reflectance Sensors since it is more efficient in tracking vertical/diagonal movement. If 4 Reflectance Sensors were used, code would have to be implemented to predict the diagonal movement using the distance formula. The pupil movement information from the sensors and the gyroscope is turned into actual movement using python and java code, specifically graphics in order to determine the corresponding x and y coordinate positions of the eye. When the pupils are not detected by the sensors, this is be interpreted as blinking. The data received by the gyroscope and its sensors from the IR LEDs are received by a Bluetooth transmission to the computer, allowing the data to control the computer's cursor.

### ***Product Image:***

The breadboard and the circuit - jumper wires, resistors, etc. - are in a Print Circuit Board (PCB) in order to maximize efficiency and minimize size. This PCB is finally connected to a ~5 Volt battery. All of this is within a case that is attached to the side of the L-Eye-t glasses. There is also a button on the side of the left lens of the glasses. The L-Eye-T glasses are connected to the computer wirelessly via a USB 2.0.

### ***Specifications:***

QTR-1A Reflectance Sensor: Voltage: 5V, Current: 17mA, Resistance: 294 $\Omega$

Arduino gyroscope: Voltage: 4V, Current: 1.5mA, Resistance: 2666 $\Omega$

Arduino Uno: Voltage:6-20V, Current: 50mA-200mA, 20mA per pin, Resistance: 250 $\Omega$

Battery pack: Voltage: Voltage: 5V, Current: 2500mA

