Microcontrollers

ARDUINO AND TEENSY

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Microcontrollers:

A microcontroller is a specific type of CPU, which runs a set of instruction multiple times, apart from CPU it has also got ram and rom, i/o pins, ADC and DAC integrated into it.

It is used to do small repetitive tasks. A set of instructions are programmed.

Difference	Arduino (UNO R3)	Teensy (3.5)
CPU	Atmega 328 (16MHz) (32bit)	ARM Cortex 4 (120MHz) (8-bit)
CAN BUS port	0	1
I2C port	1 (a4/a5)	3
SPI port	2	3
Real Time Clock	No	Yes
Flash	32kb	512kb + sd card slot
RAM	2kb	192kb
EEPROM	1kb	4kb
Input voltage	7-12v	3.2v
Pwm pins	6 (8bit)	22 (16bit)
Total digital pins	14	21
Serial ports	2	6
dimensions	6.3*1.8*0.5	8*5.5*2.5 cm3
Ethernet	100mbps capable	No port

Arduino IDE:

The Arduino language is based on c and is compiled and edited in Arduino ide.

First we pick a port of communication to Arduino board(which is done over usb). Then we have 2 parts to the code, the setup and the loop.

The setup runs one time, its job is to initialize parameters, then the loop runs over and over. The loop can have code that either retrieves a result to the ide or writes the result on the memory. We can see the returned data through the serial port monitor or if the data is

two dimensional, we can plot it through serial plotter. We can also send data to the Arduino through the serial port.

The loop can be written in such a way that it continuously checks the state of sensors, the data on the state can be turned into a logical condition for a particular command to run.

The pins on the Arduino can be written high or low or we can use onboard resistor to make it digital write more stable using pull up parameter.

The analog ports can take voltage and convert it to 10-bit PWM signals through ADC converter. The digital port on the other has 8-bit PWM signals so if both the pins are used for a certain application, we will have some margin errors (after dividing by 4).

Examples of sensors and its communication:

1. Hall effect sensor: it uses three pins, Vcc, ground and a pin for digital sensor output. The pin is connected to any digital pin on Arduino. Then we do a digital.read in the loop to continuously check for change of state in the sensor output. Can be used as throttle sensor, wheel speed sensor, abs sensor.
2. Gyro sensor: it uses 5 pins, ground, vcc, x_out ,y_out ,z_out pins. The data goes to the analog pins of the Arduino and can be realized by the instruction set of the sensor. The sensor can be used to keep the headlamp level or to find the instantaneous acceleration of bike.
3. Ammeters and voltmeters: as large values of v and I are run in an EV we need to collect data through isolating the wires. Hence they can sense voltage and currents and realize those values to digital output of 8 bit precision and send to the digital pin. (for knowing stuff about the battery.