Microcontroller
Seminar:- Physical Computing

Presented by

Imran Mehmood

Kritika Rajbandhari

Group:- 2C

Overview

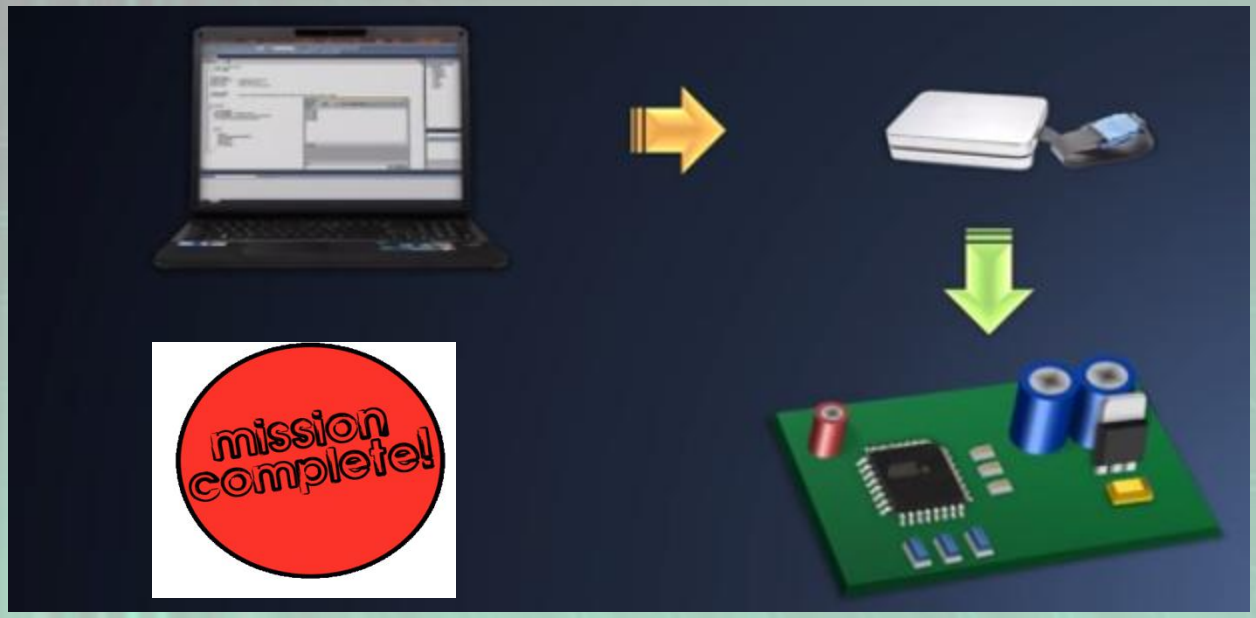
- What is a Microcontroller?
- History of Microcontroller.
- Structure and Interfacing of Micro controller
- How to program a Micro controller
- Applications of Microcontroller.
- Arduino Microcontroller(why, structure,interfacing,)
- Phidgets Microcontroller
- Arduino vs Phidgets

What is a Microcontroller?

- An integrated circuit ..

" A microcontroller needs to be programmed to be useful as the code is written for it. "

- Designed for embedded applications

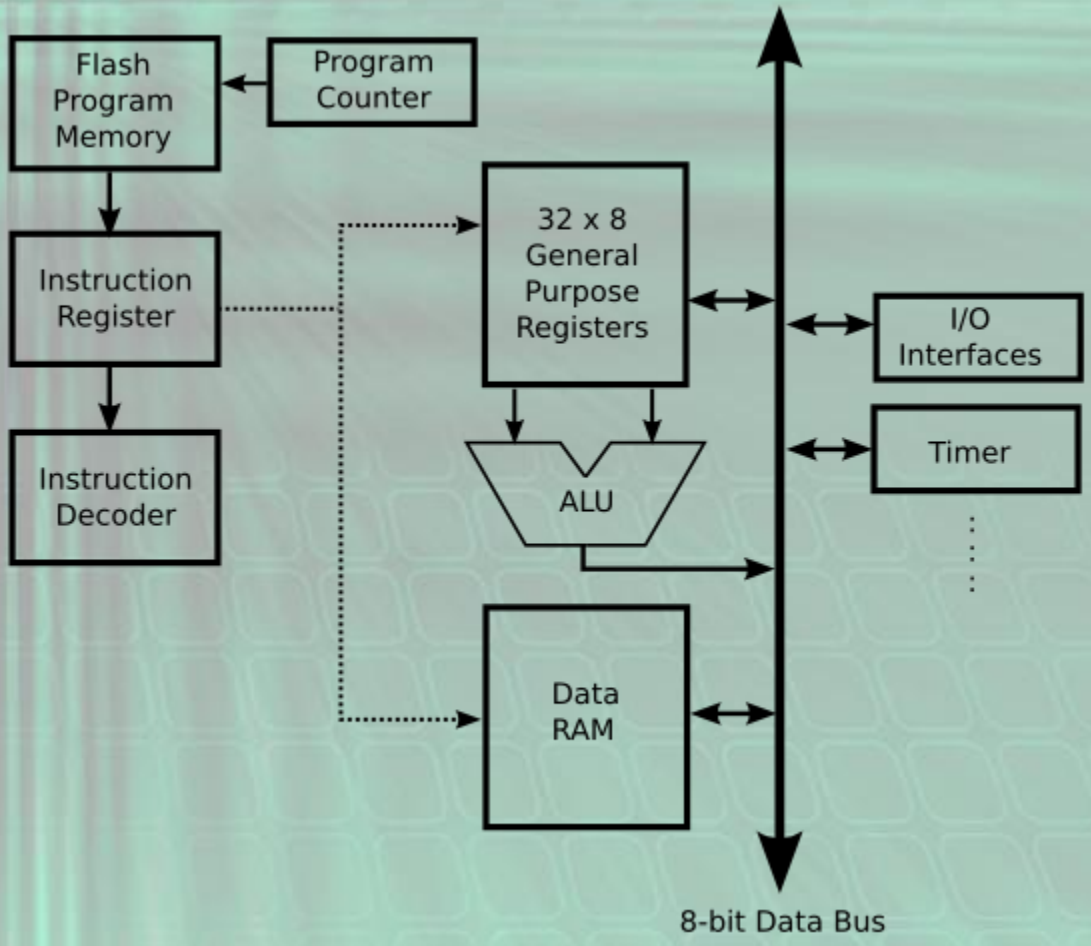


Evolution of Microcontroller

- Vaccum tubes, Transister, IC and Micro controller
- First Microcontroller 8051 developed by intel in 1980
- 8 bit intruction set and programmed with C language

Micro Controller Architecture

Micro Controller Basic Architecture



Applications of Microcontroller

- Micro controllers are everywhere in daily life
- Security system
- Transport system
- Home Appliances
- Automatic control system
- Light Sensing and Control devices
- Fire detection and safety
- Temperature Sensing and Control
- Measuring Instrument(voltage)
- Telecommunication

Application Example

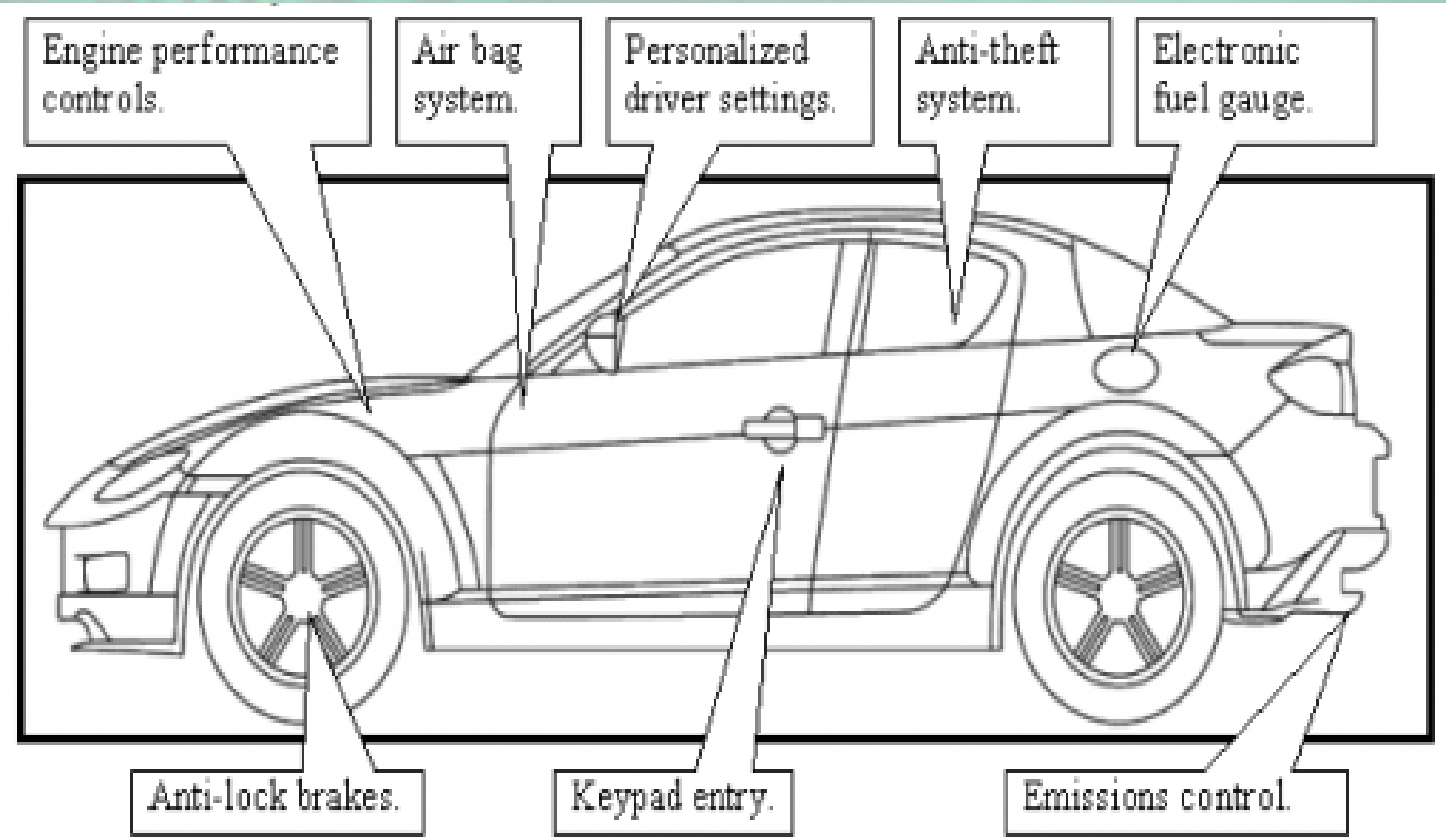


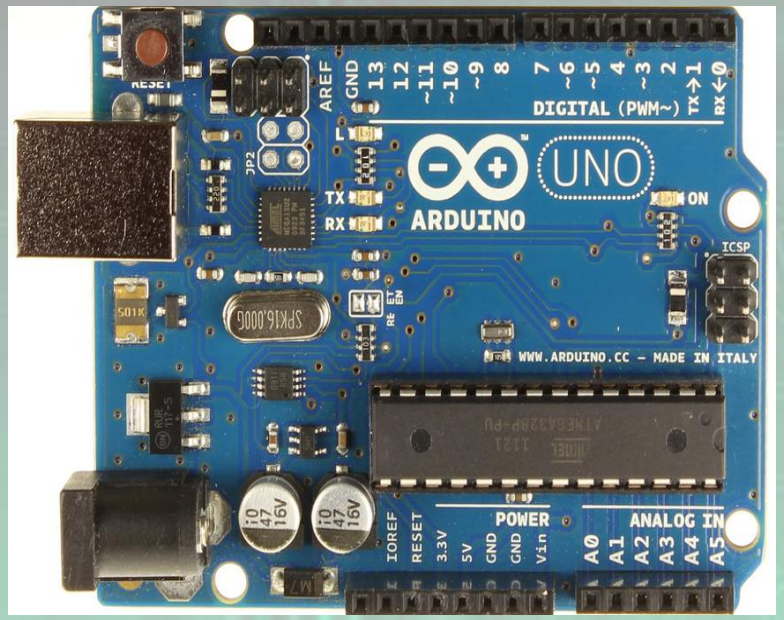
Figure 4. Automobile systems that rely on microcontrollers.

Types of Micro Controller

- Low level Micro controller like PIC microchip
- Mid Leve like Arduino
- High Level like Phidget

Types of Microcontroller

Arduino

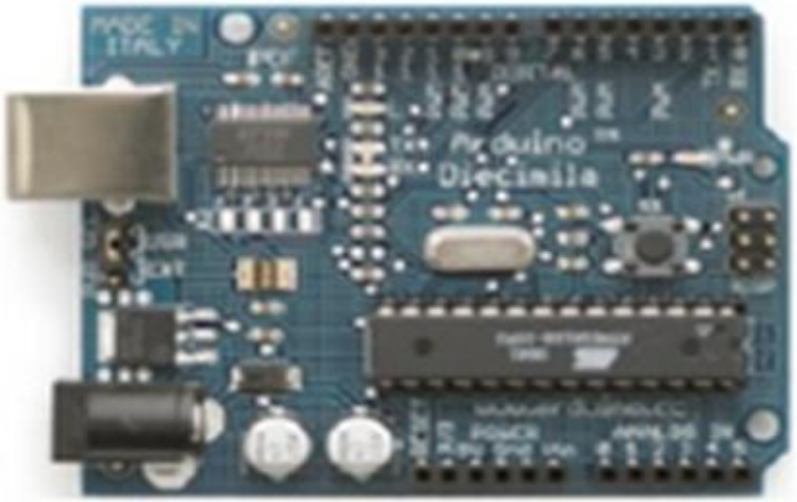


Phidgets

Arduino

- Arduino was introduced in 2005 in Ivrea, Italy
- An Arduino is an open-source microcontroller development board.

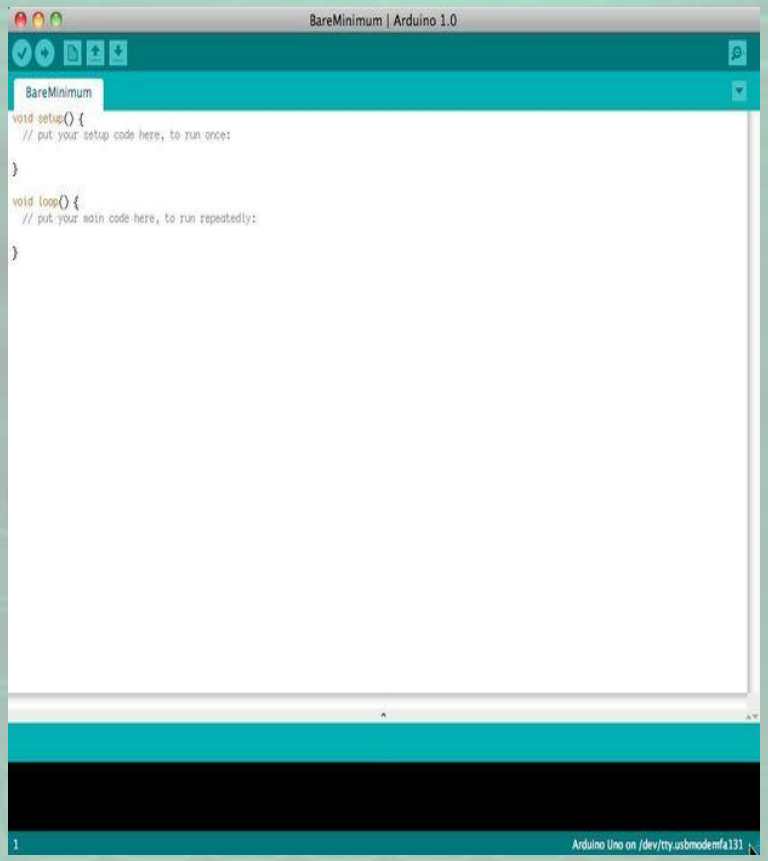
A physical piece of hardware



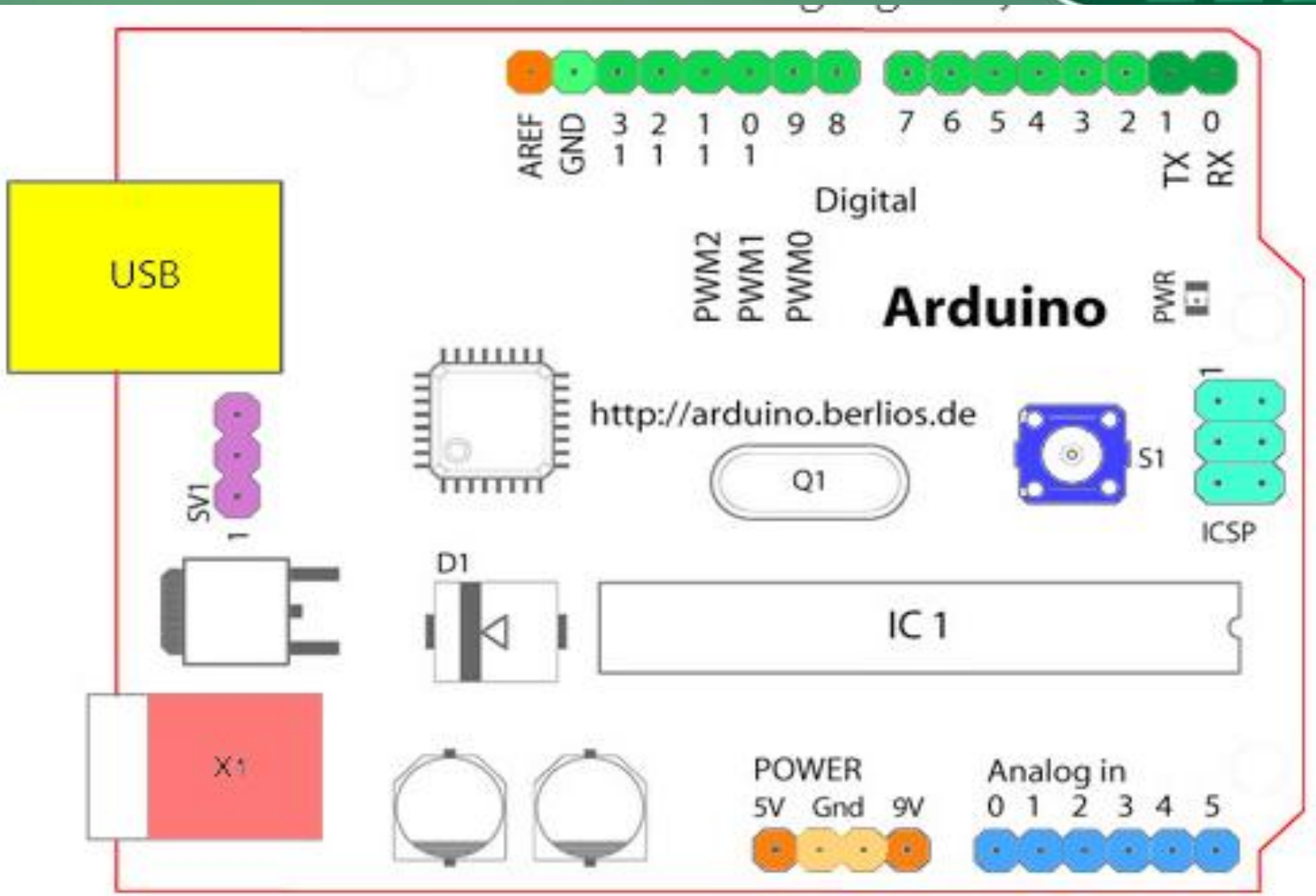
A programming environment

Programming an Arduino

- Write program,
- Compile and check ,
- Reset boards,
- Upload to board.



Arduino Hardware



- Analog Reference pin (orange)
- Digital Ground (light green)
- Digital pins 2-13 (green)
- Digital Pins 0-1/Serial In/Out – TX/RX (dark green)
- Reset Button –S1(dark blue)
- In-circuit Serial Programmer(blue green)
- Analog in Pins 0- (light blue)
- Power on ground pins(power:orange,lgrounds:light orange)
- External Power Supply -X1(pink)
- Toggels external power and USB power (purple)
- USB(Yellow)

Arduino shields

- Shilds are expansion adapter boards that plug in over top of the Arduino boards.
- There are many types of Arduino Shileds:
  - Wireless SD Shield.
  - Ethernet,
  - Motor
  - Xbee,
  - Breadboard,
  - Voice,

Contd……

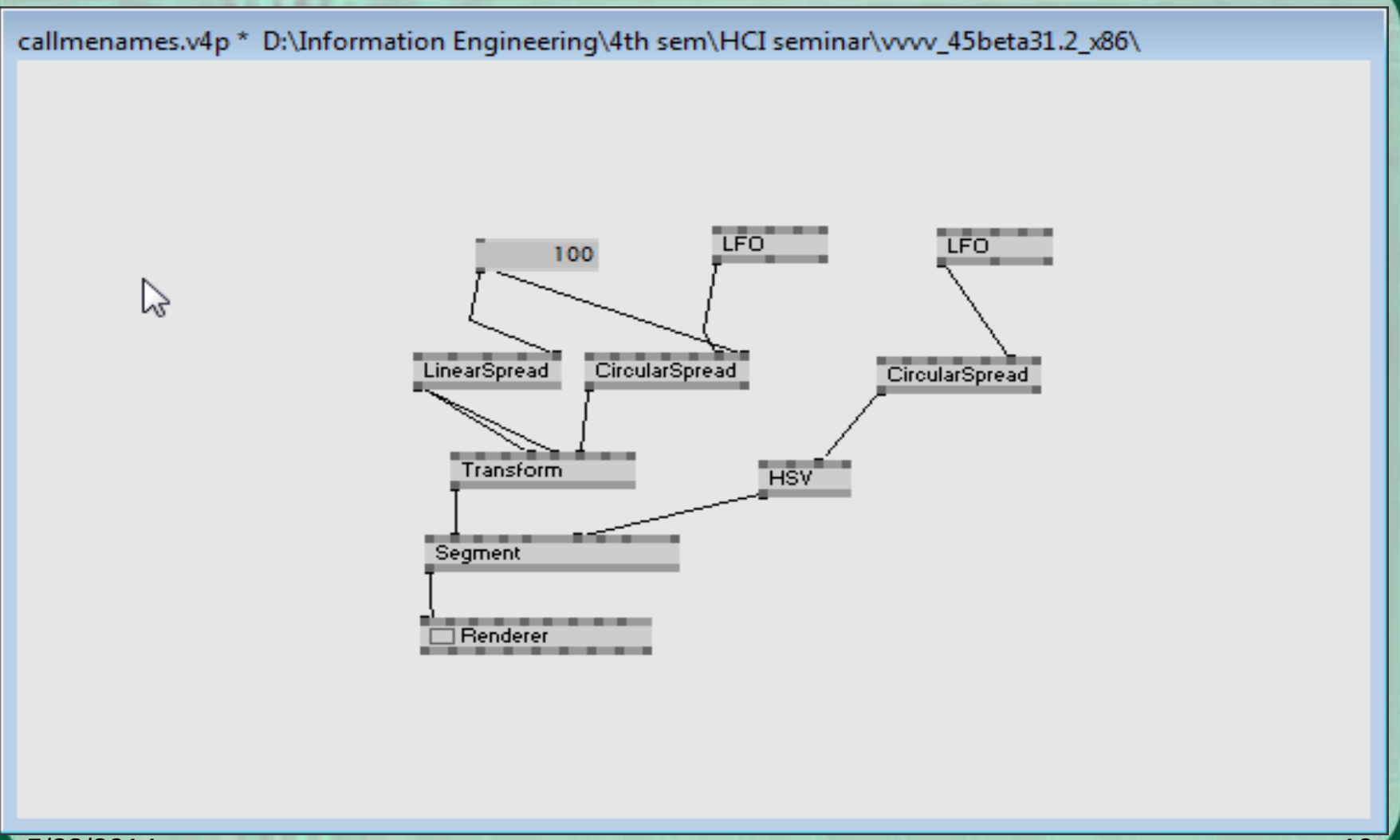
Arduino Ethernet Shield

Arduino Motor Shield

Why Arduino

- Inexpensive,
- Cross Platform
- Simple, clear programming environment,
- Open source and extensible software,
- Open source and extensible hardware. (ATMEGA8 & ATMEGA168)

Patch Of VVVV

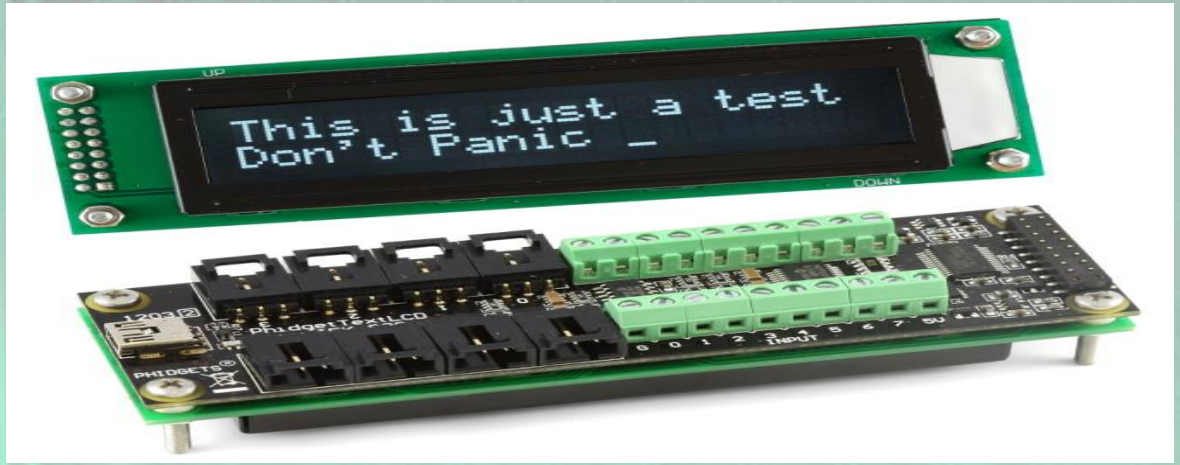


Phidget Micro Controller

- A phidget is physical representation or implementation of GUI widget
- Phidgets are to Physical interfaces as widgets are to the graphical user interfaces
- Phidgets are changing the world form GUI to tangible user inface(TUI)

Phidget Micro Controller

- Phidgets are easy to use Building blocks
- Low cost sensing and conrolling from pc
- Use Universal serial bus as interface
- Programable using languages like C or java
- Complexity is managed by API
- Use Sensors and motors for interaction

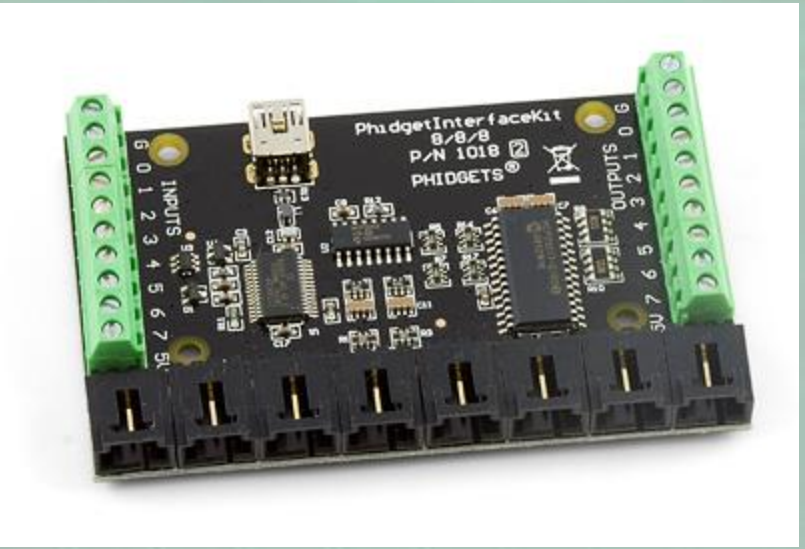


Phidget Interface Hardware

- Computer/USB Port
- Phidget Interface Board available in variable Input and Output Size
- Phidget Sensors with Interface cables
- Motors
- Phidget Actuators controllers
- Relays
- RFIDs

Phidget Interface Board(8/8/8)

- 8 Analog Inputs
- 8 Digital Inputs
- 8 Digital Outputs
- USB Port
- Core Processor

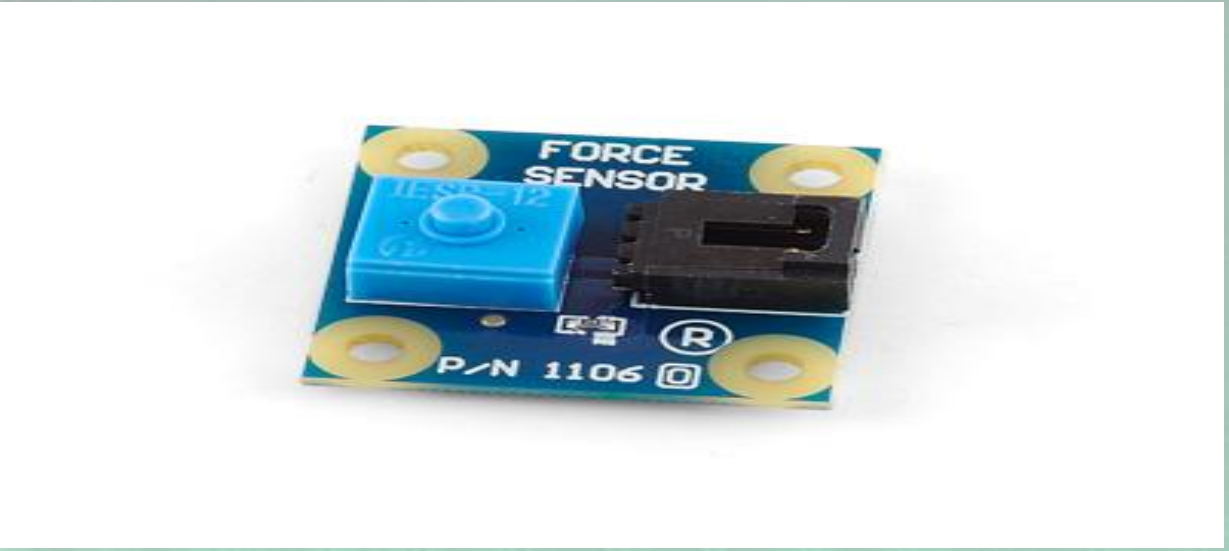


Phidget Sensors

- Force Sensor
- Motion Sensor
- Rotation Sensor
- Phidget Slider or Potentiometer Sensor
- Light Sensor
- Mini Stick Sensor
- Pressure Sensor……..

Phidget Force Sensor

- Can be used as a button for human input or
- To sense the presence of small object
- Force Sensor measures up to 3 kilograms
- Has 60cm sensor cable



Phidget Motors

- Phidget has following motors and controllers
- Servo motors
- Actuator Controllers
- Stepper Motors
- Stepper Controllers
- DC motors
- DC controllers

Phidget Servo Motors

- Control one RC servo Motor or actuator
- Control Velocity,postion and Acceleration
- Power solely by computer via USB
- Rotational movement
- Like in Hard Disk platter

Phidget Stepper Motor

- Provide good torque as less resolution
- Head movment in Hard Disk is controlled by a Stepper motor
- Back and forth movement

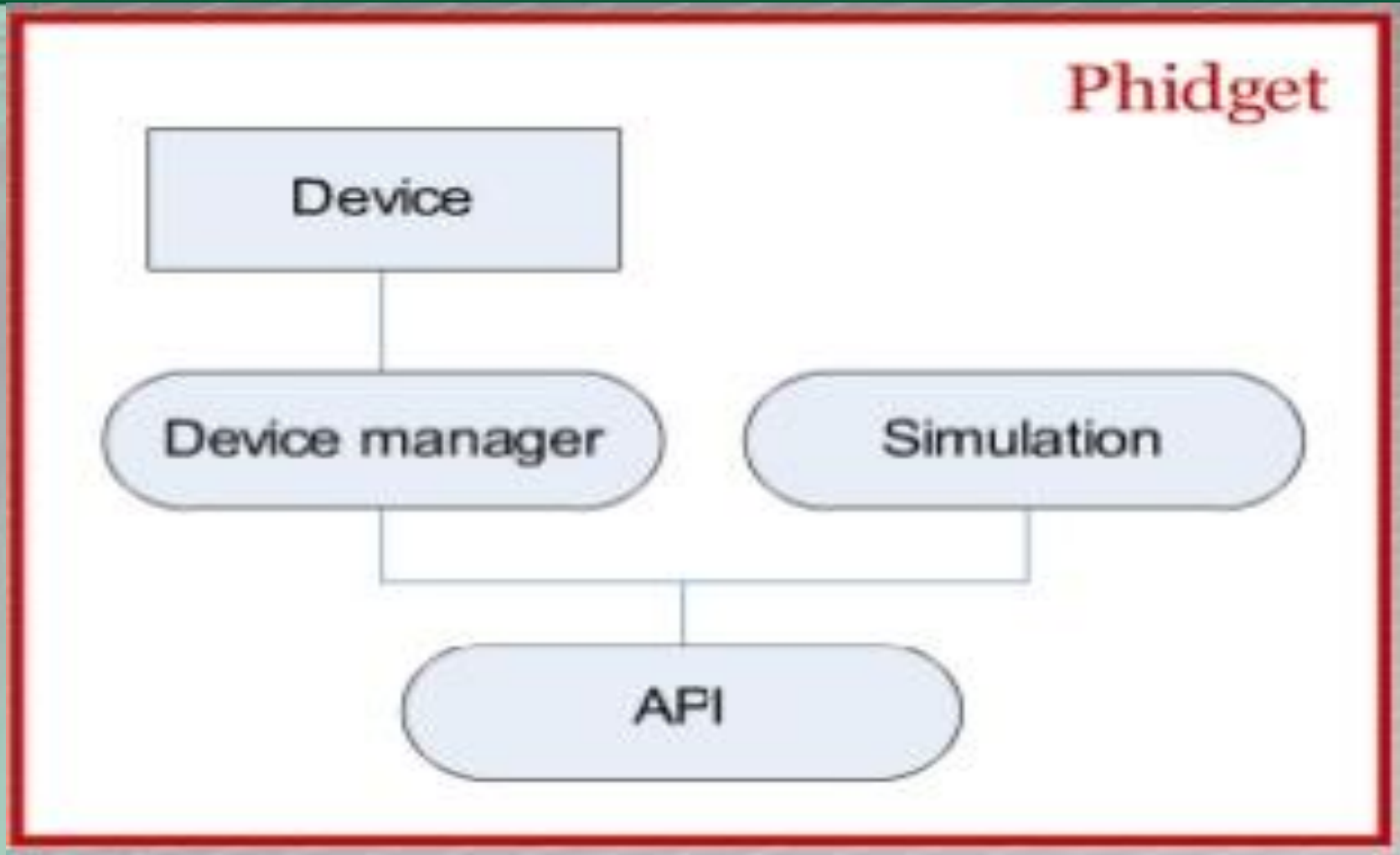
Phidget Hardware Model

- All phidgets are connected to computer via USB
- Most computer support more than 127 devices
- Can be directly connected to PC or through Hub
- The maximum cable length for USB connection is 15 feet
- Supported on USB port 1.1 and 2.0

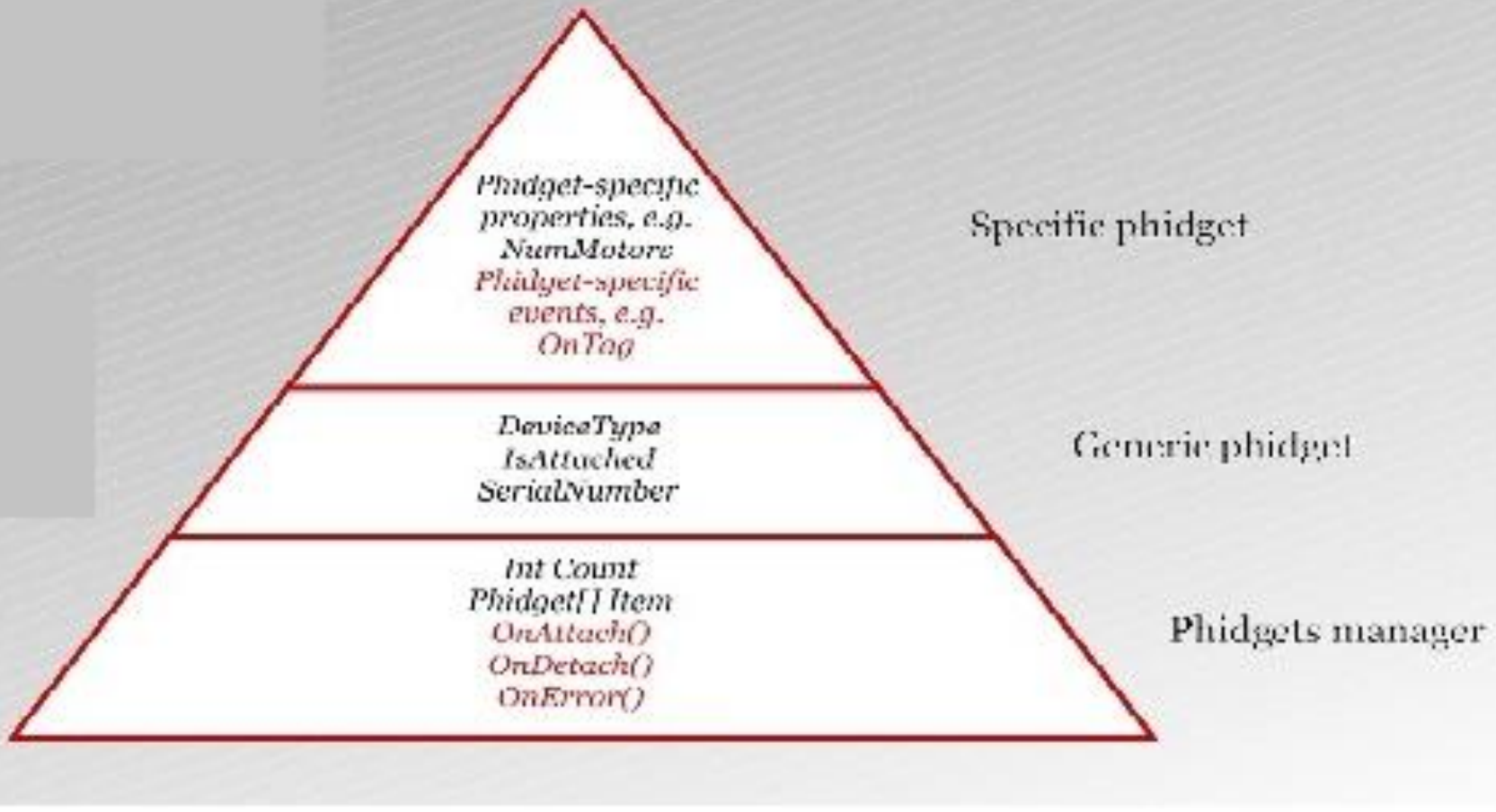
Phidget Software Model

- Operating system support win 2000 or later
- Bottom level API is C library phidget 21
- It is cross platform library and use low level protocols
- Other higher level libraries are com,.NET,Java, Python
- Also provided with Phidget webservice

Phidget Software Model



Phidget Software Model….



Phidget Goals

- To provide Physical Interaction
- Make easy for non specialized experts to create(don’t need a hardware implementation vision and Expert)
- Abstract proper functionality through a well defined API
- Hide hardware implementation details

Phidget Values

- Low Cost
- Reusable
- Versatile
- Rapid Prototyping for Physical Interfaces

References and Citation

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Thanks For Your Attention !!