Exploring

MCU: ~~Interfacing~~ Technologies

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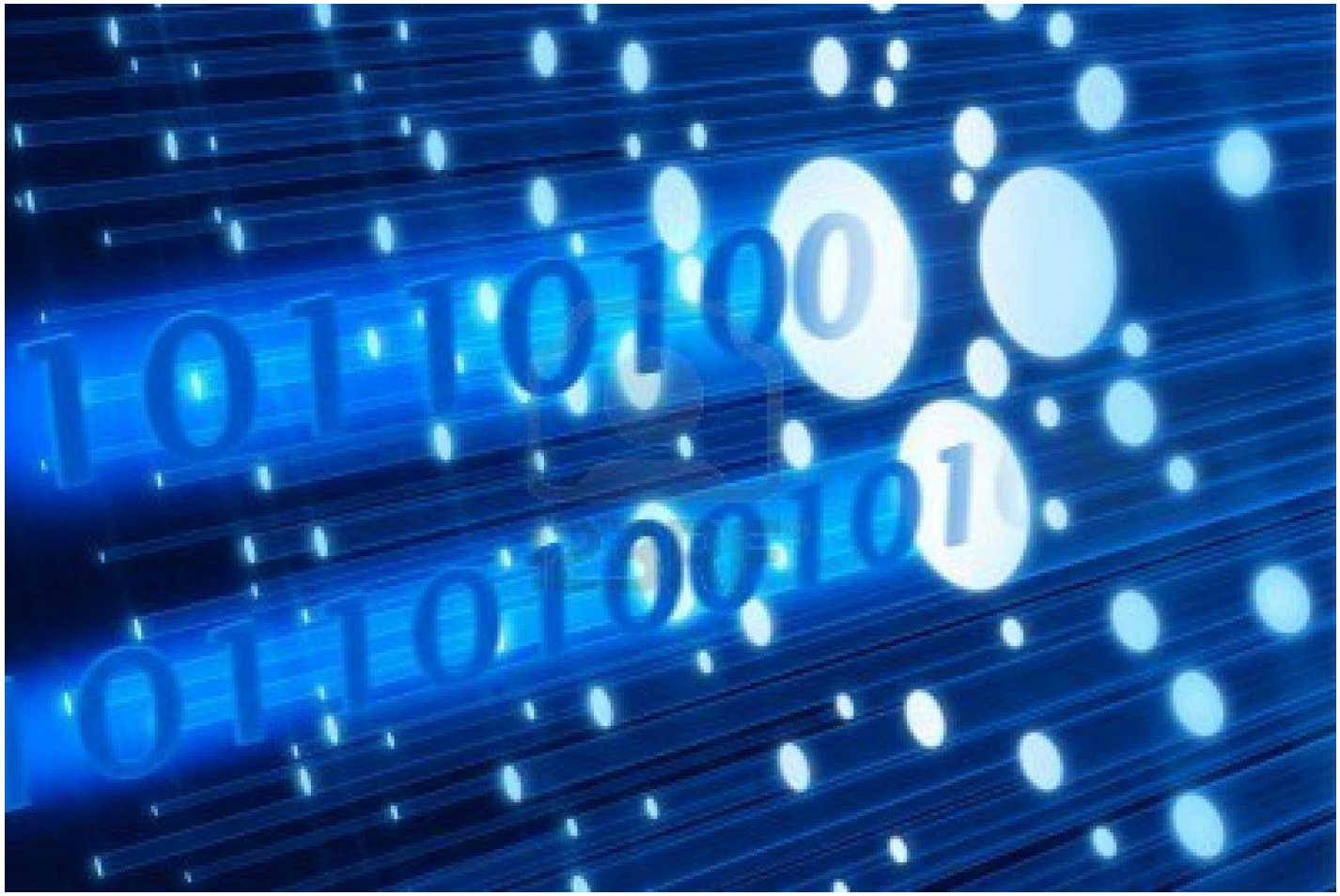
RFID Bands

GSM

GPS


Sixth Ave
38th St
New Core Labs
SIDBI
Environmental Engineering Bldg
Third Ave
35th St
34th St
33rd St
IIT M
Gate 4
Nankari
NW Labs
IIT Kanpur
32nd St
31st St
34
Overhead Water Tank
62nd St
A
IIT Kanpur
Hall of Residence II
Main Dr
Main Dr
Main Dr
Hall 5
21st St
Hall of Residence 1
22nd St
11th St
First Ave
Hall of Residence IX
Hall of Residence III
41st St
Fifth Ave
Fourth Ave
23rd St
12th St
ACES Grounds
24th St
Hall 7
Hall-10
25th St
Sixth Ave
Hall 8
64th St
Student Activity Center (new)

Communicating with an MCU



Communication in MCU's

Three modes are possible:

- Simplex
- Half-Duplex
- Full-Duplex

UART: Universal Asynchronous Receiver Transmitter

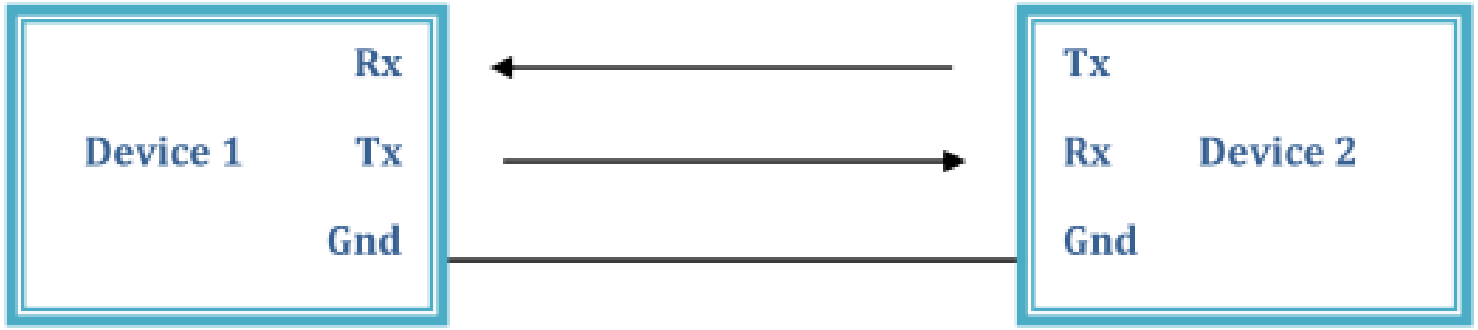
- What makes it ‘universal’ ?
  - Its parameters (format,speed ..) are configurable.
- Why ‘asynchronous’ ?
  - It doesn’t have a clock

UART Basics

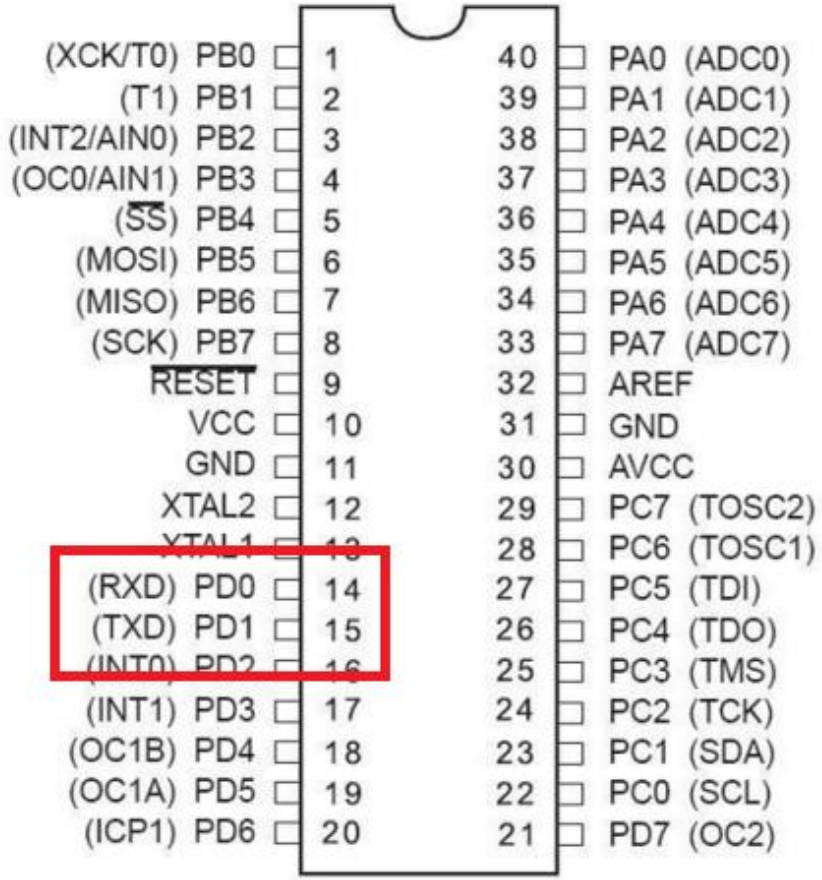
- Baud Rate:
  - No. of bits transmitted/received per second = _____bits/sec.
- Format of Communication

Figure 17: Basic UART packet format: 1 start bit, 8 data bits, 1 parity bit, 1 stop bit.

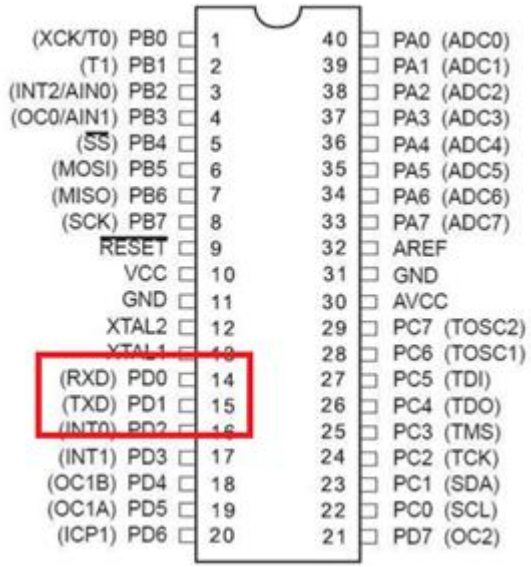
Connections for UART



UART in AtMega16

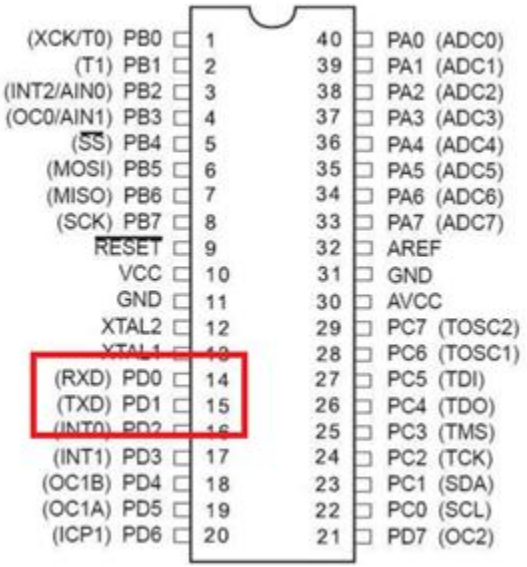


Connecting AtMega16's with UART



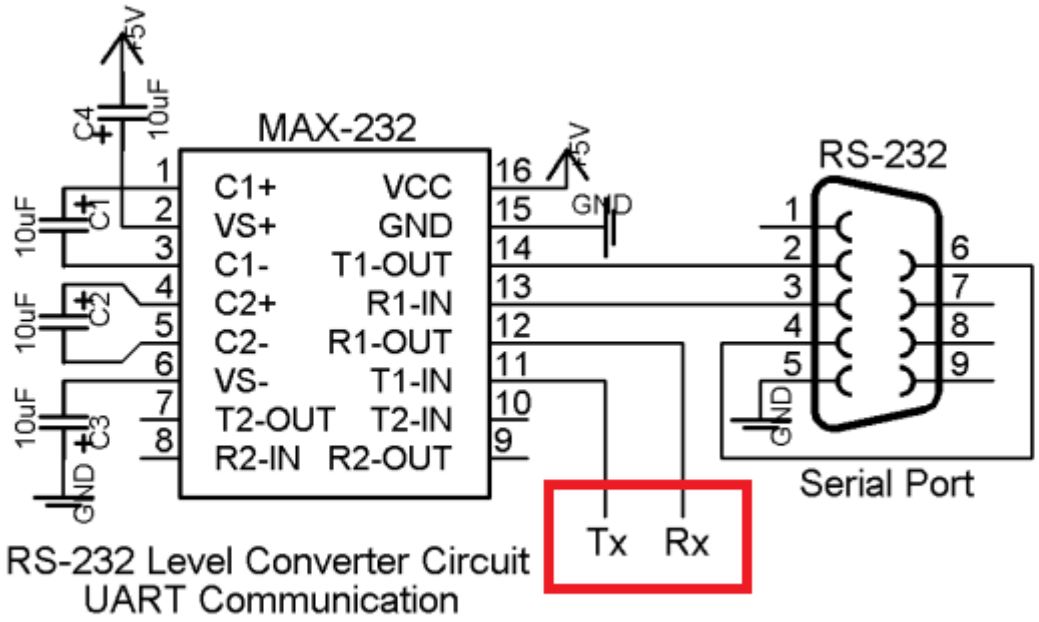
Device 1

Rx	?	Tx
Tx	?	Rx
GND	?	GND



Device 2

MAX-232 and USB-Serial



Connecting AtMega16 with Computer

- Latest Direct Way :

Coding with UART

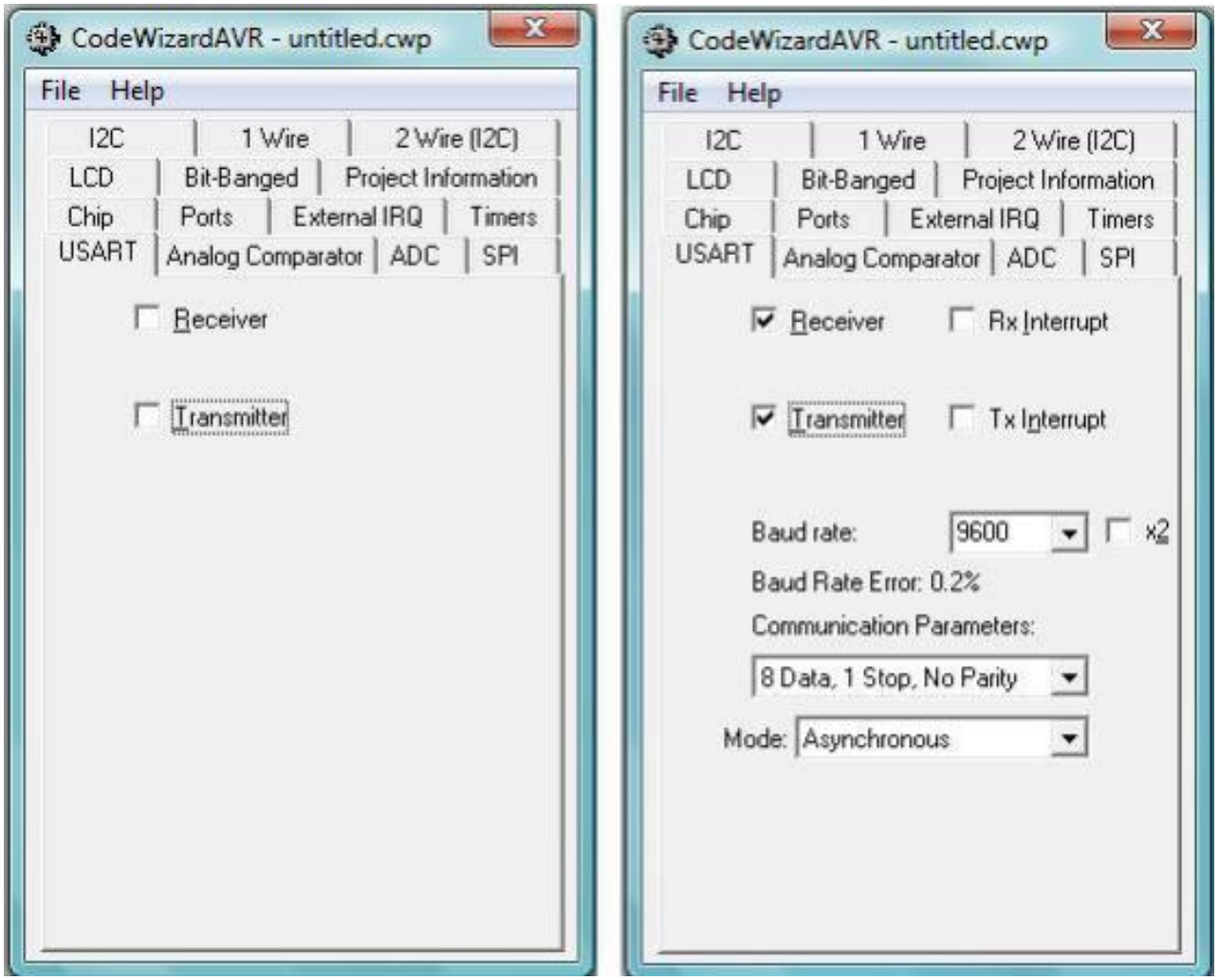
- Three simple commands :
  - putchar(char);

    sends 8-bit characters through UART
  - getchar();

    receives 8-bit characters via UART
  - puts(string);

    sends a constant string

Where do we code.. ?



Sample Code for UART

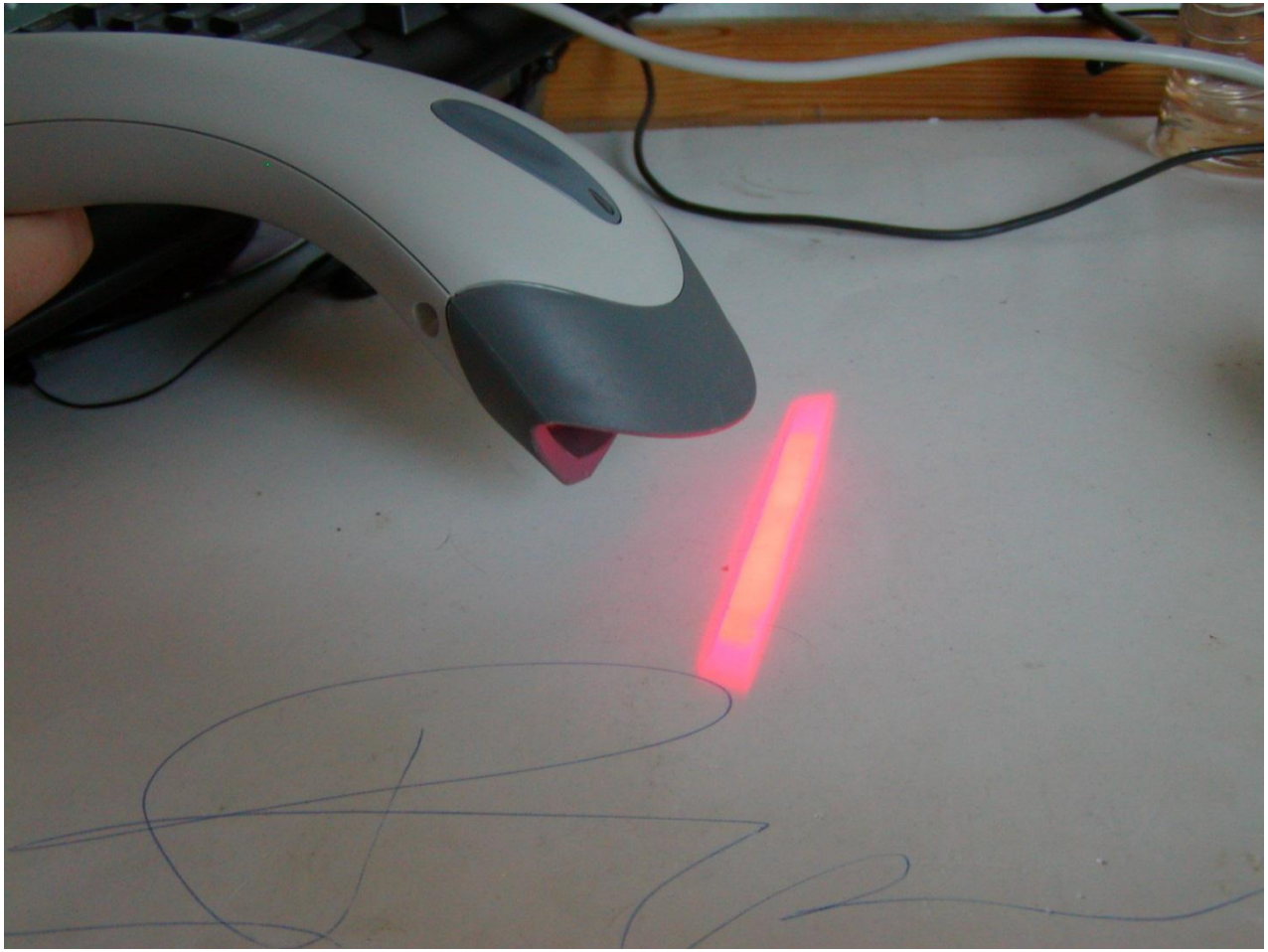
- Transmitter Code:

```
if(PORTA.1 == '0')
    putchar('a');
```

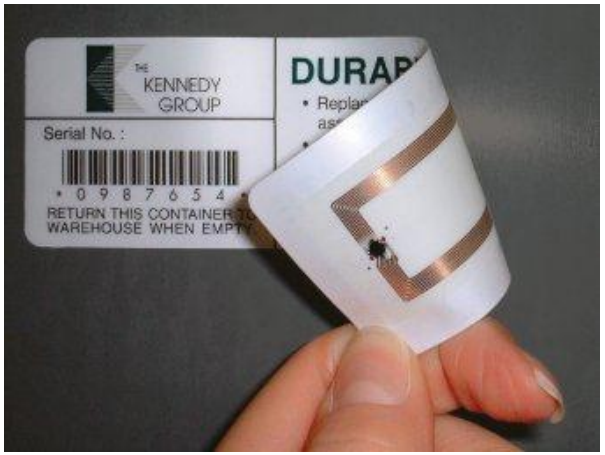
- Receiver Code:

```
c = getchar();
lcd_putchar(c);
```

Barcode Scanner



RFID: Radio Frequency Identification



1. Tag

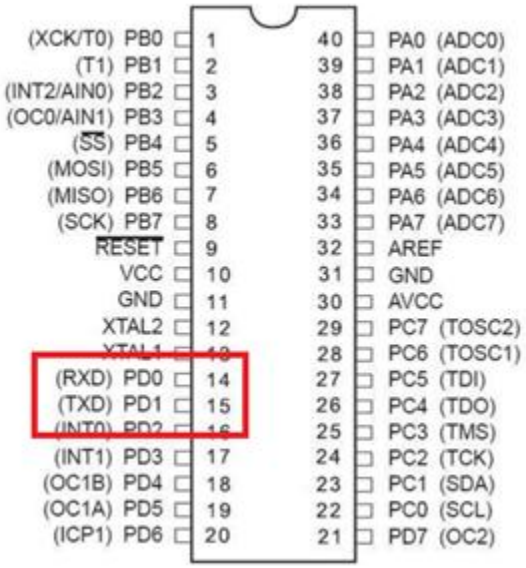
2. Reader

RFID Tags

- A Tag is a tiny silicon chip(IC) with an antenna.
- Types of tags :
  - Active
  - Battery Assisted Passive (BAP)
  - Passive

RFID: MCU Interface

Rx	?	Tx
Tx	?	Rx
GND	?	GND



Device 1

Device 2

RFID: MCU Coding

- Enable UART buffer before you code.
- char ID[15];

  .....

  ......

  for(i = 0, i <= ; i++) {

  ID[i] = getchar();

  lcd_puts(ID); }

UART buffer settings in CVAVR will soon be uploaded.

Cool Applications

GSM: Global System for Mobile Communications

- It is a standard set for 2G cellular networks.

GSM Module

1. Modem

2. SIM card

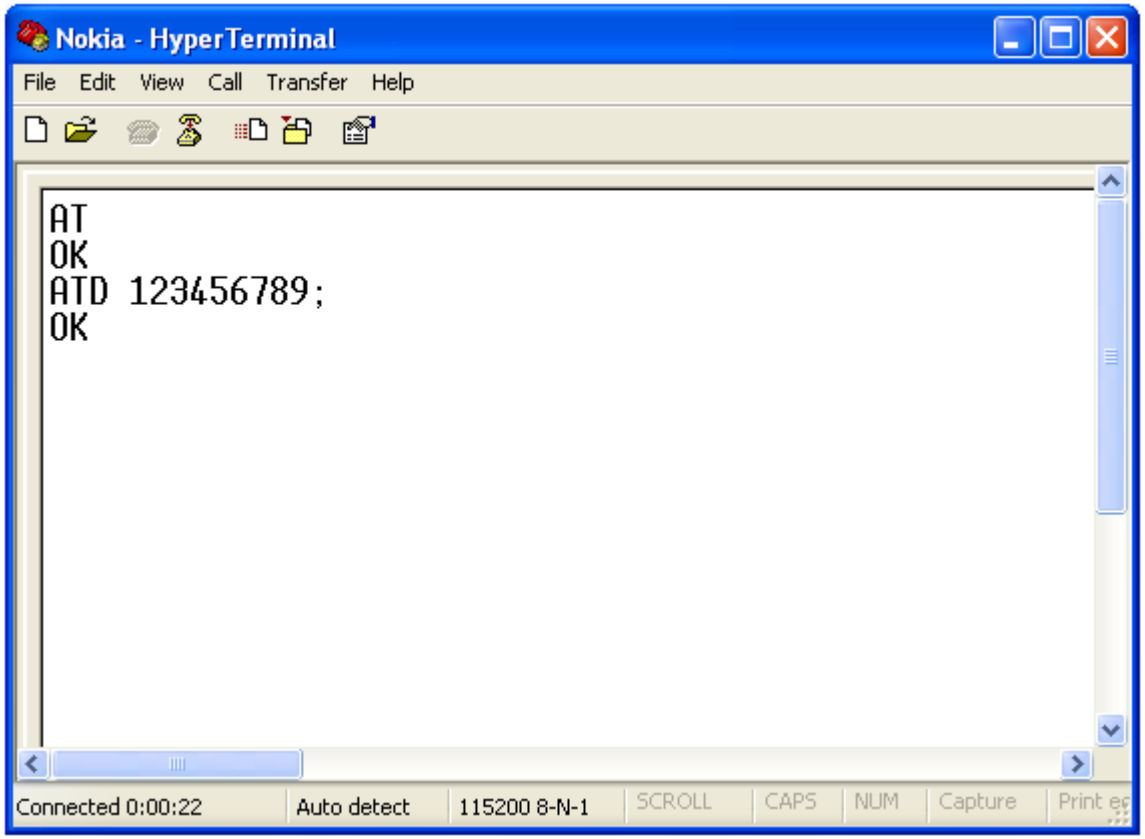
Only for the Geeks !!

SIM300 IC

Features Supported

- SMS
- Voice Calling
- GPRS
- Support for Speaker

GSM Modem: Computer Interface



Terminal Settings can be found at:

http://www.developer.nokia.com/Community/Wiki/AT_Commands

AT Commands Basics

- AT+X? //Queries value of X
- AT+X= //Sets value of X

- ATD 9559753551; //Calls number

  OK

- Entire AT command set can be accessed from:

http://www.developer.nokia.com/Community/Wiki/AT_Commands

SMS: Using AT Commands

- Two message modes: PDU and Text
- AT+CMGF=1 //Text Mode

  OK

  AT+CMGS="9559753551"

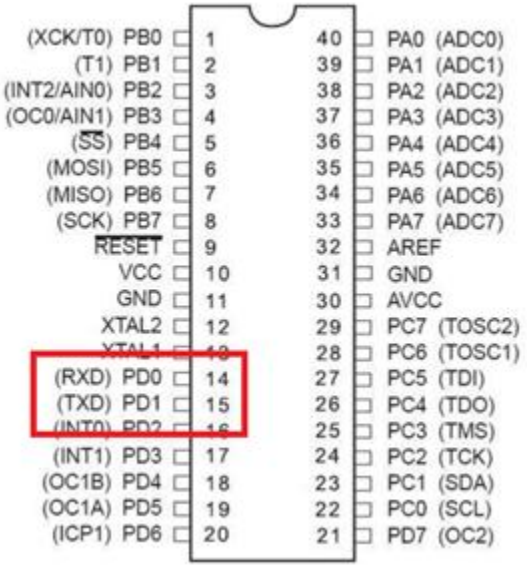
  > Hello World<Ctrl>+<Z>

  +CMGS: 44

  OK

GSM Modem: MCU Interface

Rx	?	Tx
Tx	?	Rx
GND	?	GND



Device 1

Device 2

AT Commands: MCU Coding

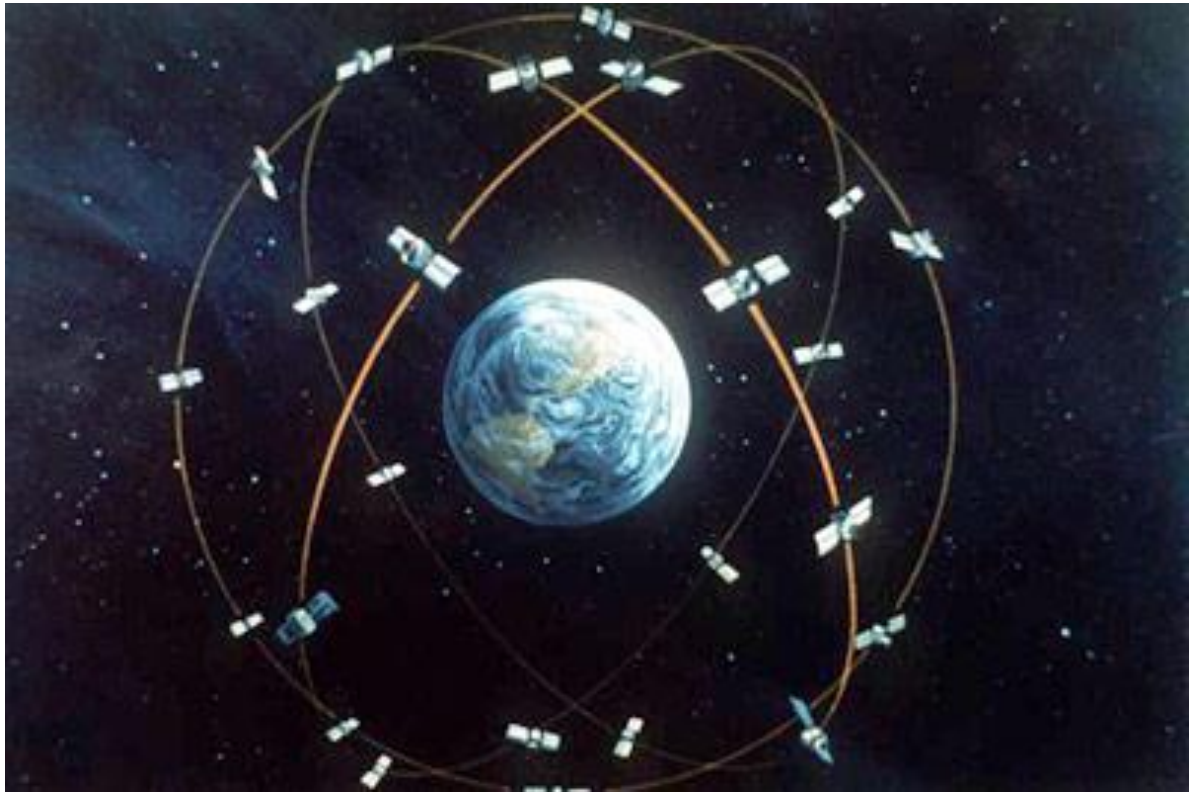
- char ack1,ack2;
- void sendsms() {

```
puts("AT");
ack1 = getchar();
ack2 = getchar();
if(ack1 == 'O' && ack2 == 'K')   //check "OK"
    puts("ATD 9559753551;");
        return  }
```

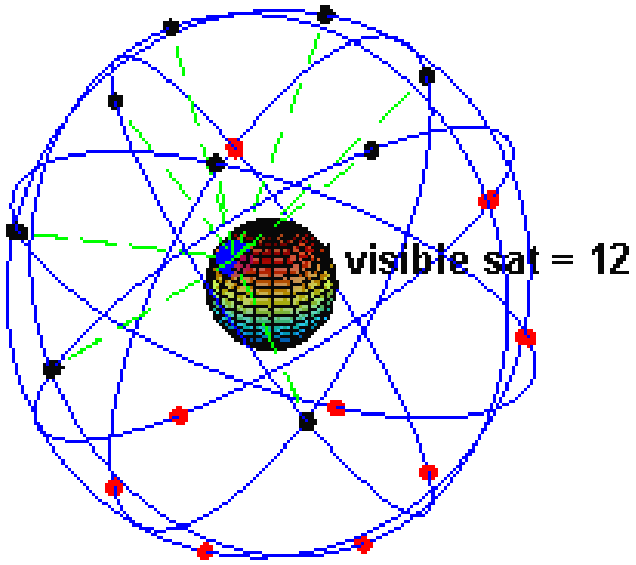
Agent Ethan Hunt
Impossible Missions Force

Mission: Hunting the bad guys !!

GPS: Global Positioning System



Visible Satellites



Distance Calculation

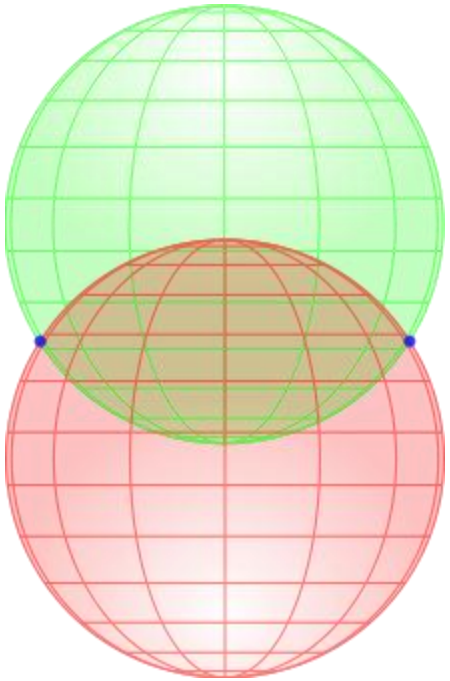
Value Sent: t1
Time Sent : t1

Value Received: t2
Time Received : t2

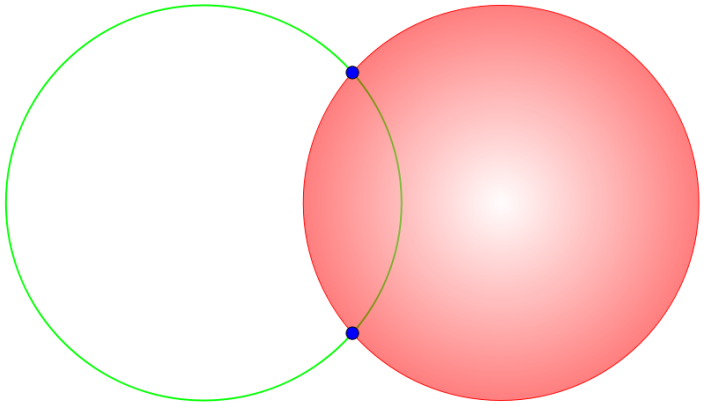
- Distance = speed x time taken

  = c x (t2 – t1)

Triangulation Basics

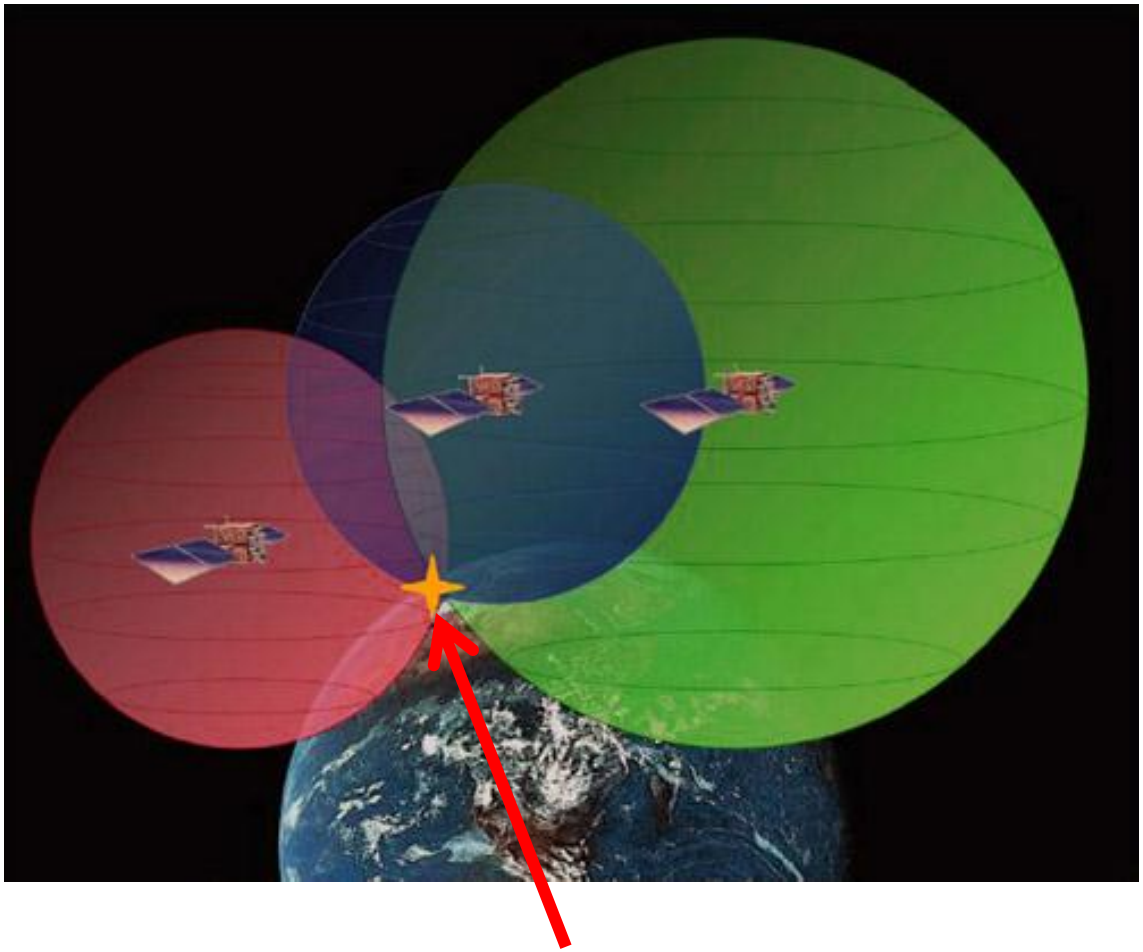


1. Two spheres intersecting in a circle.



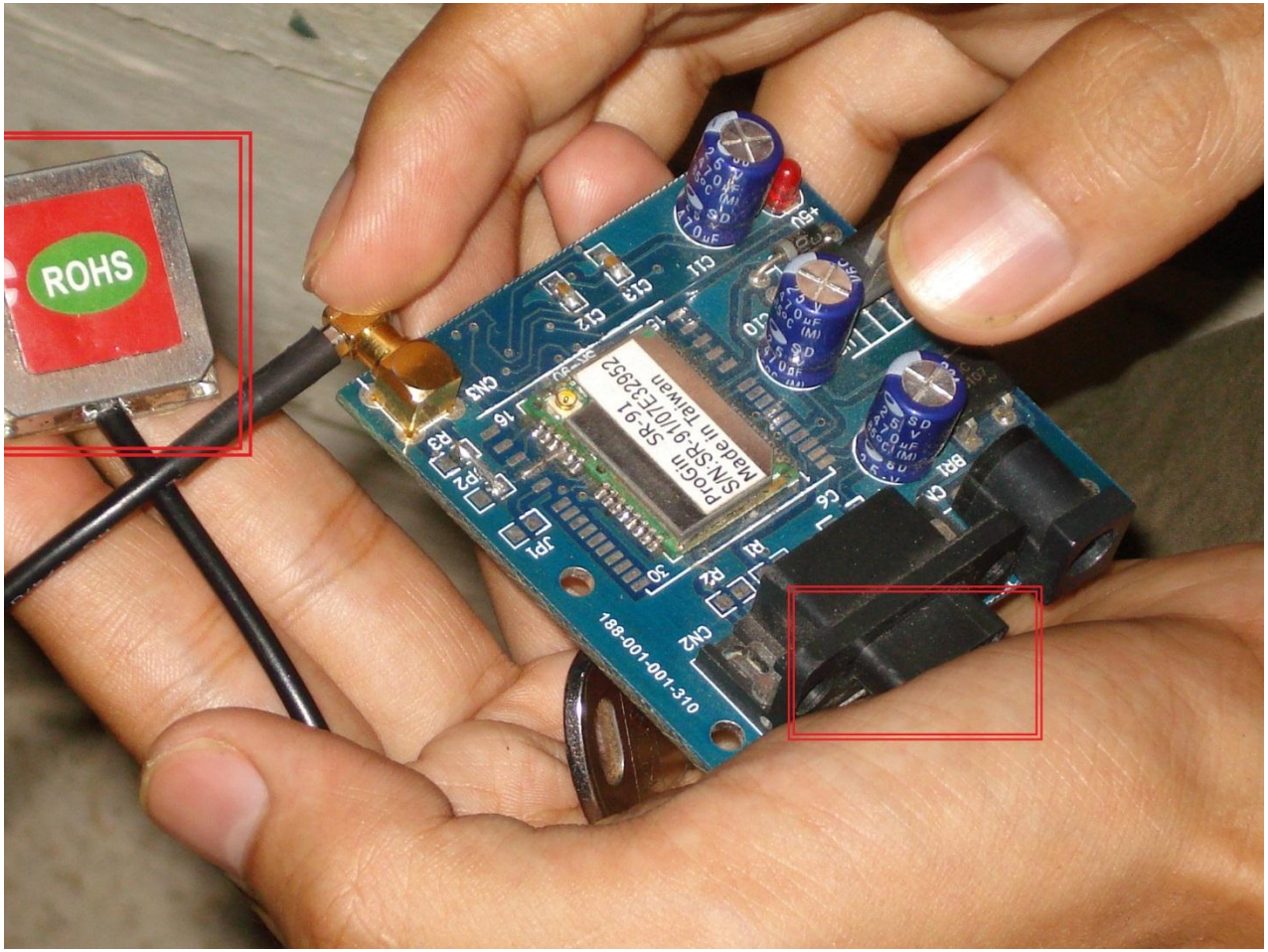
2. Surface of a sphere intersecting a circle.

Triangulation

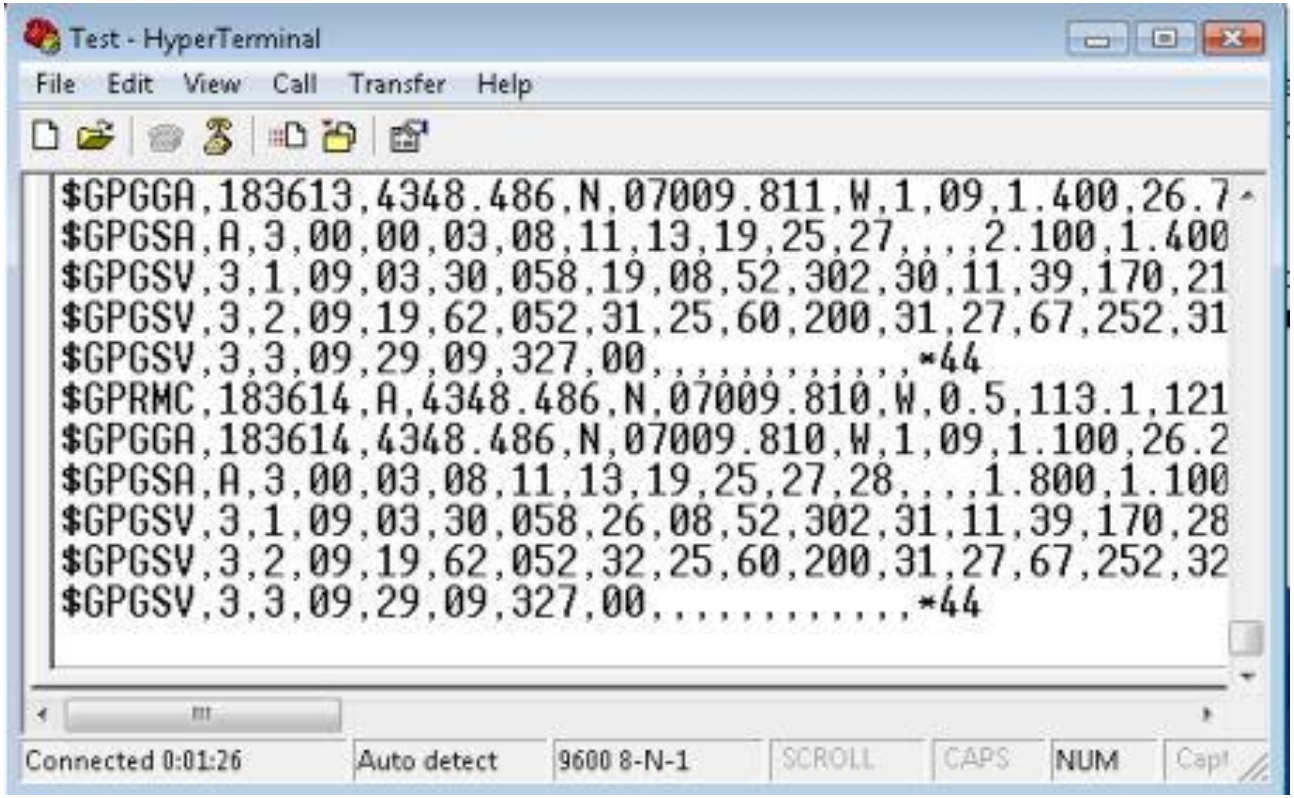


Target Locked: He is here !!

GPS Module


ROHS
ProGin SR-91/07E32952
S/N:SR-91/07E32952
Made in Taiwan
188-001-001-310

Terminal Data Collected



Terminal Settings can be found at:

http://forum.delorme.com/viewtopic.php?t=12267

NMEA Format

- $GPGGA,123519,4807.038,N,01131.000,E,1,08,0.9,545.4,M,46.9,M,,*47
  - 2 is Latitude
  - 4 is Longitude
  - 6 is Quality //0: invalid, 1: GPS fix
  - 7 is No. of satellites in view

Detailed list of sentences can be found at:

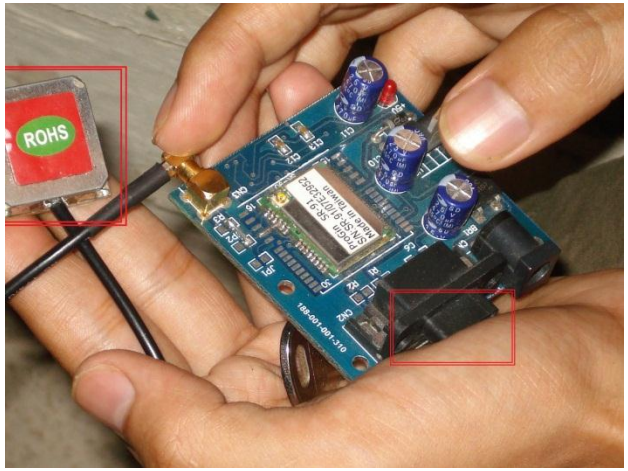
http://aprs.gids.nl/nmea/

GPS Visualizer

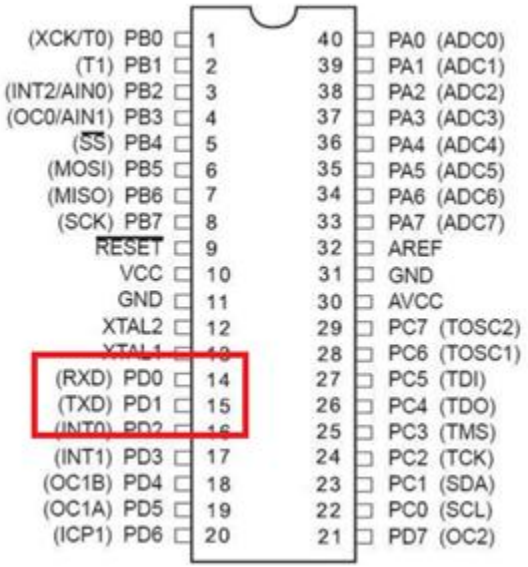
- Go to: http://www.gpsvisualizer.com/
- Upload your GPS file
- Get your map !!

  GPS-Visualizer.html

GPS: MCU Interface



Rx	?	Tx
Tx	?	Rx
GND	?	GND



Device 1

Device 2

GPS: MCU Coding

- Enable UART buffer before you code.
- char GPS_data[100];

.....

People who are crazy enough to think they can change the world are the ones who usually do.

```
for( i = 0, i <= ; i++) {
GPS_data[i] = getchar();
lcd_puts(GPS_data); }
```

UART buffer settings in CVAVR will soon be uploaded.

“People who are crazy enough to think they can change the world are the ones who usually do.”