Max Speed Indicator MSI - عين

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Outline

- Introduction
- Requirements & Specifications
- System Design
  - Solution Concept
  - Architecture
  - Component Design
- System Integration
- Testing & Debugging
  - Issues
- Conclusion

Introduction

The problem?

Saher (2014):

6.8 Billions SR

↳ **2300/family**

Requirements

- Functional
  - Obtaining street max speed
  - Notification when exceeding speed limit
  - Must work everywhere

- Non Functional
  - Quick response
  - Low power consumption
  - Reasonable cost

Specification

- Response time less than **10** seconds

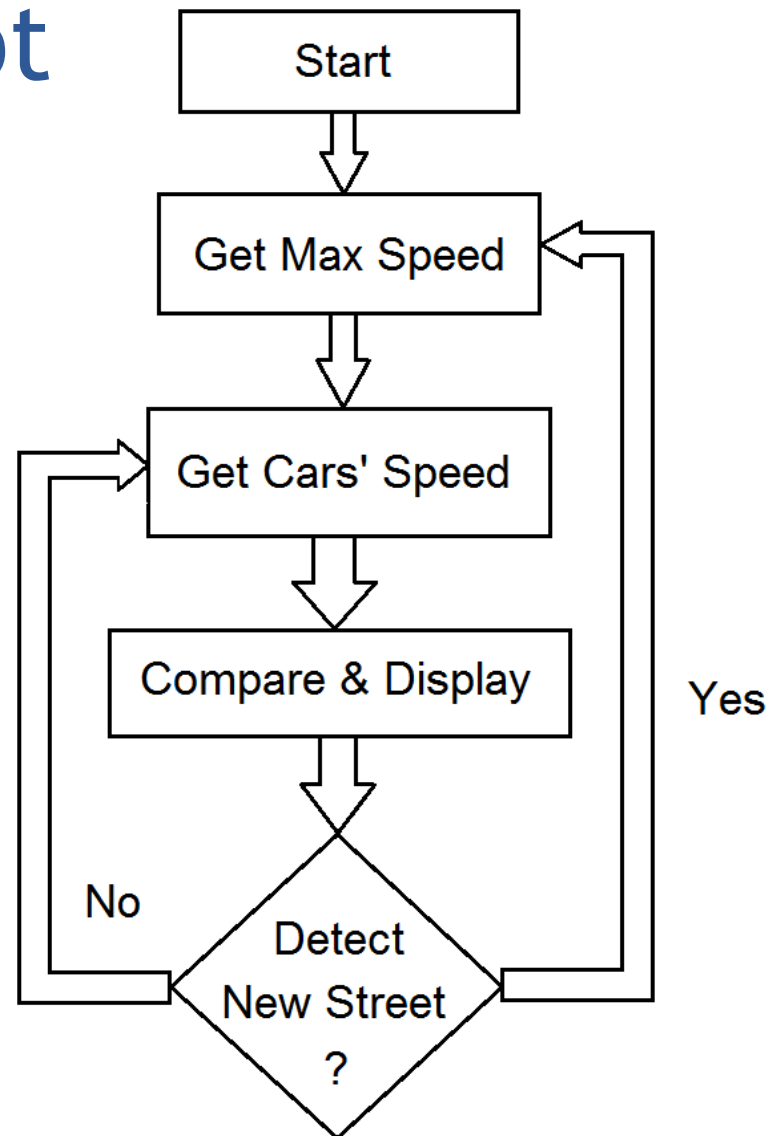- The cost should not exceed **799** SR

- Power consumption should be < 8 Watt

Existing solution
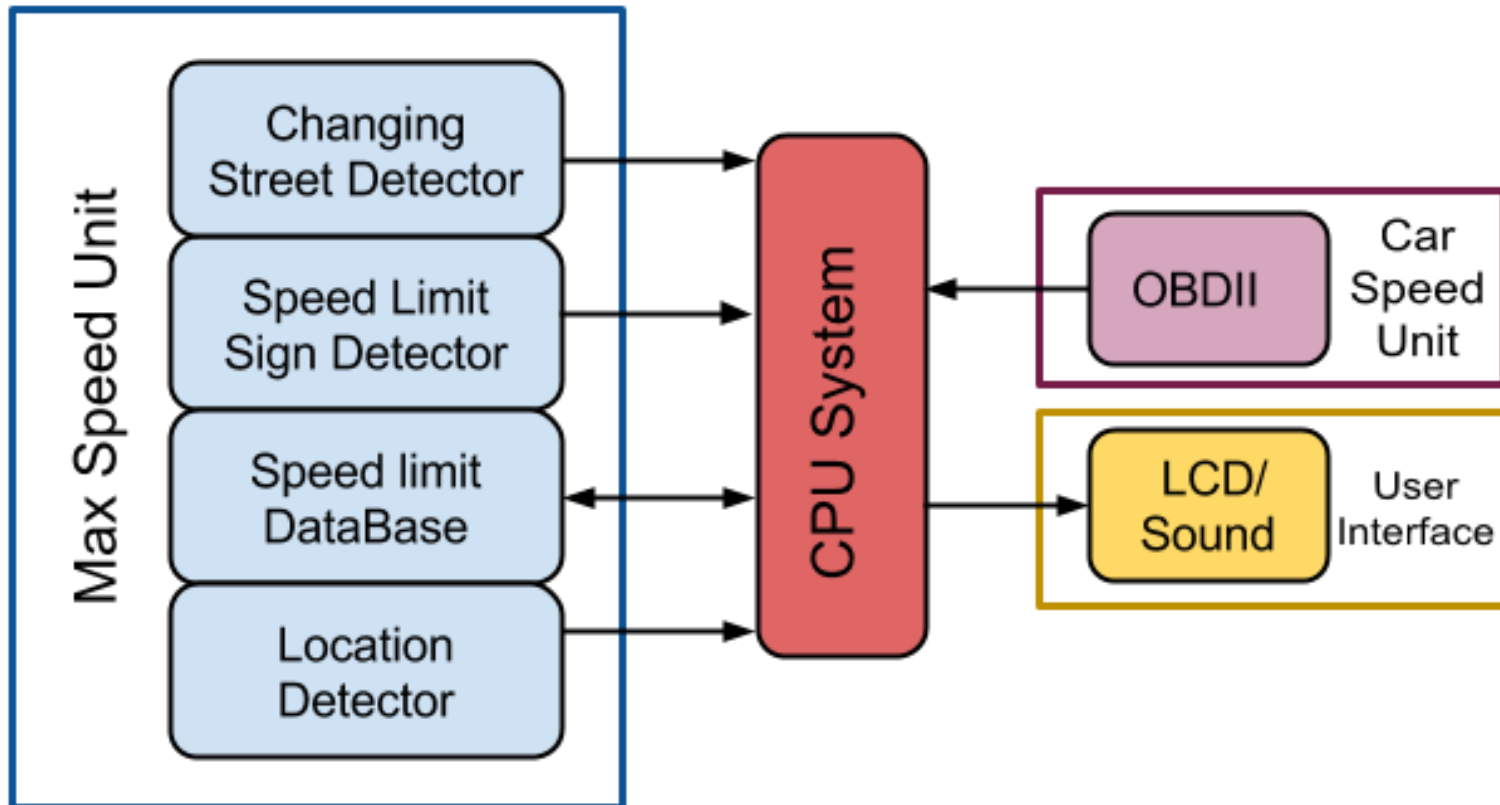
System Design
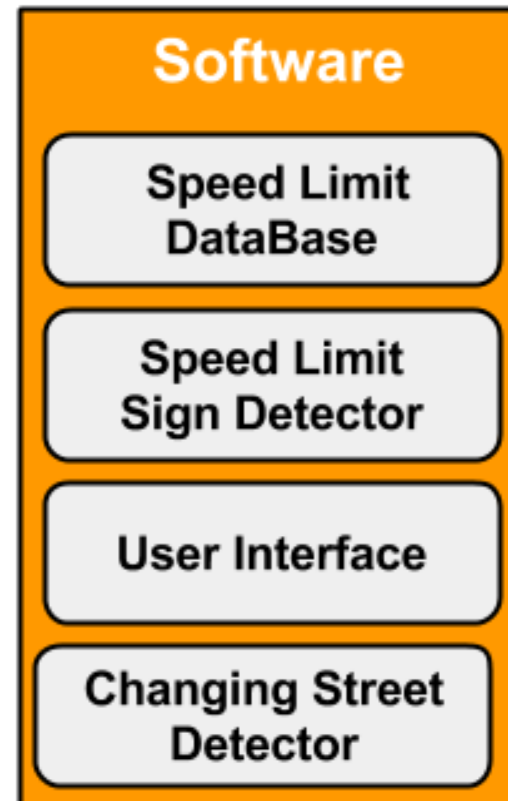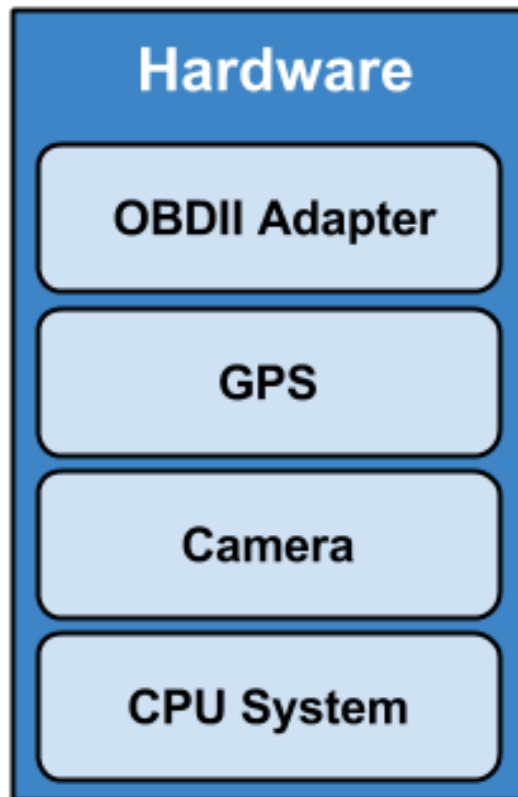
Solution Concept

Alternatives/Approaches

- **<u>RFID-Only Architecture:</u>**

- **<u>Database-Only Architecture:</u>**

- **<u>Camera-Only Architecture:</u>**

Architecture

HW/SW Components

Hardware

- OBDII Adapter
- GPS
- Camera
- CPU System

Software

- Speed Limit DataBase
- Speed Limit Sign Detector
- User Interface
- Changing Street Detector
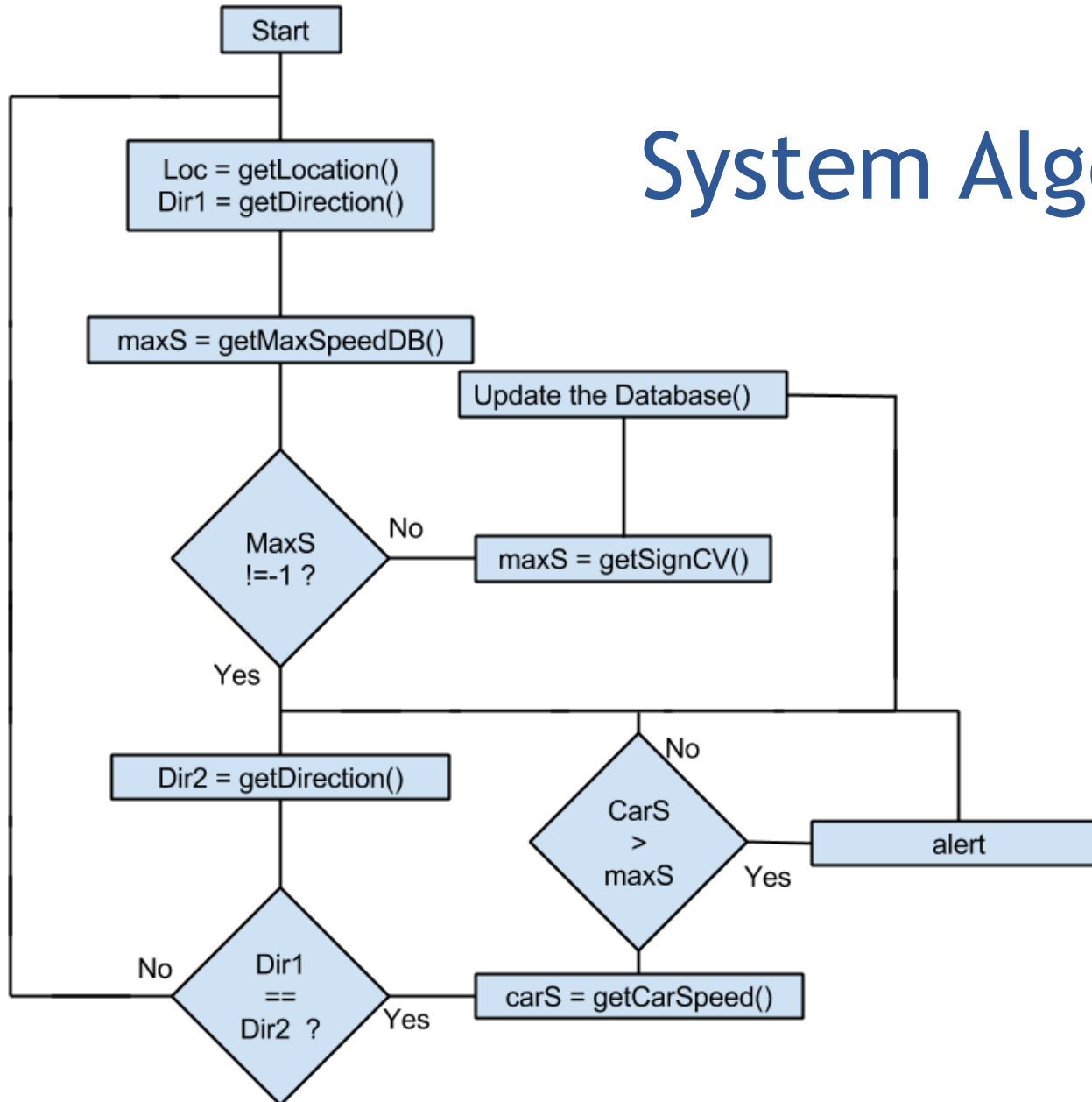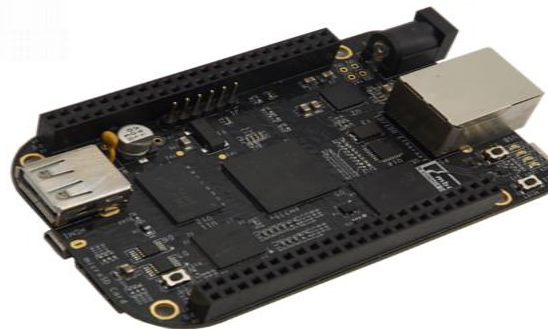
System Algorithm

Component Design

off-the-shelf components

Component Design :

- Microcontroller

Component Design :

- Microcontroller

|	Pi 2 B	BBB	Edison
CPU	Cortex A7	Cortex A8	Atom + Quark
Cores	4	1	2 + 1
Clock	900MHz	1000MHz	500MHz
GPU	Videocore IV	PowerVR SGX530	None
Memory	1GB	512MB	1GB
USB Ports	4	2	1*
Flash	None	2GB	4GB
Storage	microSD	microSD	microSD*
Network	10/100	10/100	None
GPIO	40-pin	2x46-pin	70-pin Hirose
Wifi	No	No	Yes
Bluetooth	No	No	Yes
RRP	$35	$49	$85*

Speed limit Database

- OpenStreetMap

Car Speed Detector

- OBD2

Location Detector

- GPS
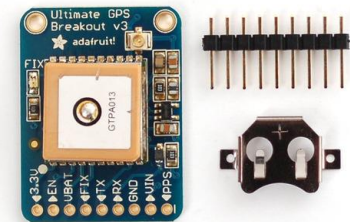
User Interface

- LCD – Sound - Button

Component Design

Custom components

Changing Street Detector

Component	Cost	Power	Accuracy
GPS	$0	5 V	High
Accelerometer	$20	3.3 V	Medium
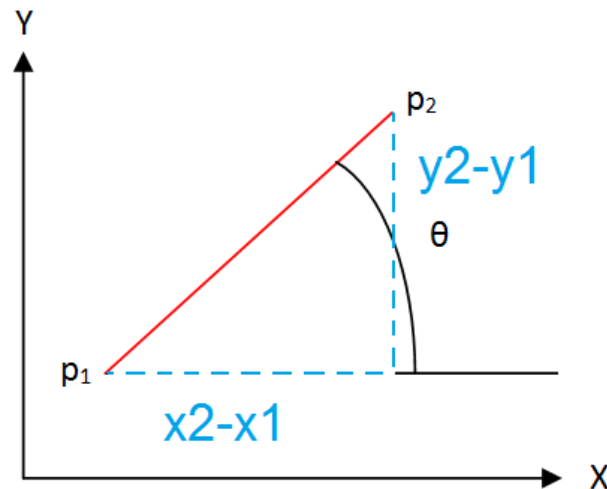
Speed Limit Sign Detector

- ## Sign Identification

- ## Digit Recognition

Sign Identification

- **Sign Templates only:**

- **Filtering then using templates:**

Sign Identification

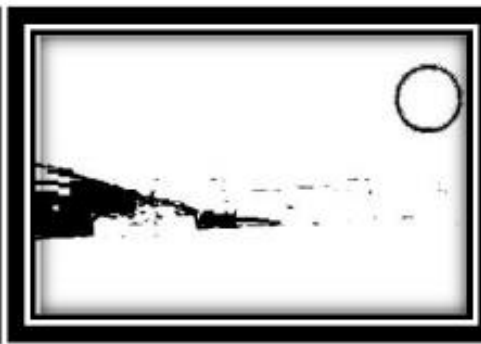- **Filtering then using Circle Detection:**

Digit Recognition

- **Feature extraction:**

98214808651328230664 70938
44609550582231 72535940812
848111745028410270193852 1
105559644622948954930381 9
644288109756659334461 2847

System Integration

Standard Interfaces

- **UART** : Interface GPS with the board.

- **EvZ USB:** Interface OBD2 with the board.

- **XML**: Interface with the Database via HTTP.

- **OBD2**: Interface the board with the Car.

- **MIPI- CSI-2**: Interface the camera with the board.

Testing & Debugging

Testing & Debugging

GPS:

PRN:	Elev:	Azim:	SNR:	Used:
12	83	196	45	Y
14	50	286	26	Y
9	44	117	29	Y
25	44	239	33	Y
17	14	036	16	Y
32	09	341	21	Y
4	12	076	21	N
22	09	257	00	N
2	03	114	00	N
29	02	188	00	N
31	01	292	00	N
15	00	165	00	N

```
Latitude:       50.1486708    N
Longitude:      26.3046816    W
Altitude:       192.3 m
Speed:          n/a
Heading:        n/a
Climb:          0.0 m/min
Status:         3D FIX (8 secs)
Longitude Err:  +/- 10 m
Latitude Err:   +/- 12 m
Altitude Err:   +/- 0 m
Course Err:     n/a
Speed Err:      +/- 88 kph
Time offset:    0.476
Grid Square:    IO85
```

Testing & Debugging

Sign Identification:

Testing & Debugging

Digit Recognition:

Issues

Issues:

- **<u>Standard Speed Limit Sign?</u>**
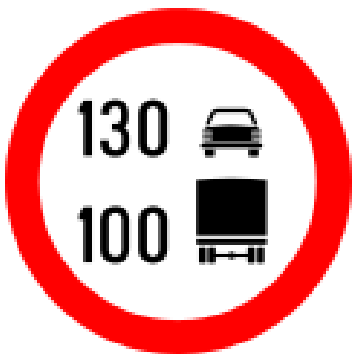
Issues:

- **<u>System Collapsing…</u>**
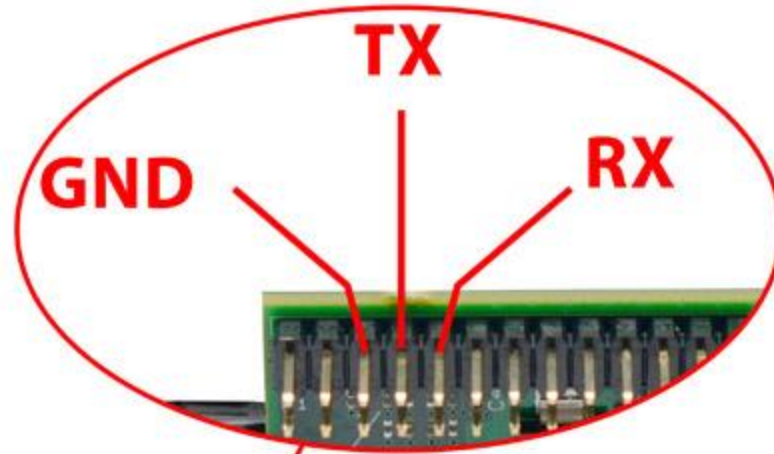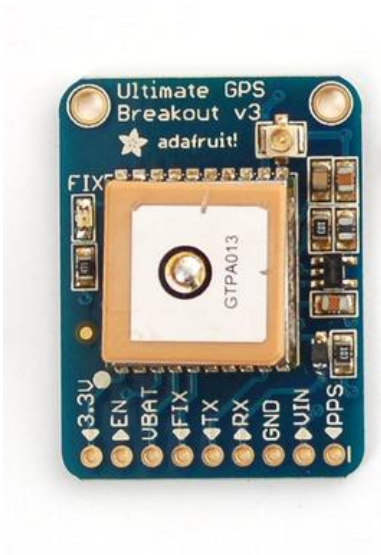
- **<u>Thanks to BitBucket !</u>**

Issues:

- ## **<u>OAuth Problem</u>**

.	Source	Destination	Protocol	Length	Info
24	192.168.43.78	128.40.45.196	TCP	66	3872→80 [SYN] Seq=0 Win=8192 Len=0 MSS=1460 WS=4 SACK_PERM=1
26	128.40.45.196	192.168.43.78	TCP	66	80→3872 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1380 SACK_PE
27	192.168.43.78	128.40.45.196	TCP	54	3872→80 [ACK] Seq=1 Ack=1 Win=66240 Len=0
28	192.168.43.78	128.40.45.196	HTTP	229	PUT /api/0.6/changeset/61176/close HTTP/1.1
29	128.40.45.196	192.168.43.78	TCP	54	80→3872 [ACK] Seq=1 Ack=176 Win=30720 Len=0
30	128.40.45.196	192.168.43.78	TCP	54	[TCP Previous segment not captured] 80→3872 [FIN, ACK] Seq=428
31	192.168.43.78	128.40.45.196	TCP	54	[TCP Dup ACK 28#1] 3872→80 [ACK] Seq=176 Ack=1 Win=66240 Len=0
32	128.40.45.196	192.168.43.78	HTTP	481	[TCP Out-Of-Order] HTTP/1.1 200 OK
33	192.168.43.78	128.40.45.196	TCP	54	3872→80 [ACK] Seq=176 Ack=429 Win=65812 Len=0
34	192.168.43.78	128.40.45.196	TCP	54	3872→80 [FIN, ACK] Seq=176 Ack=429 Win=65812 Len=0
35	128.40.45.196	192.168.43.78	TCP	54	80→3872 [ACK] Seq=429 Ack=177 Win=30720 Len=0

Conclusion:

- Demo

- We learned A lot!

  - Python, OpenCV, Linux, Mercurial,

    Teamwork, Design & Planning

- What is next….
        MSI 2.0

Thank You

Questions...