COMENIUS UNIVERSITY IN BRATISLAVA
FACULTY OF MATHEMATICS, PHYSICS AND
INFORMATICS

INTERNET OF THINGS IN AUTOMOTIVE INDUSTRY

Bachelor's thesis

2016 **Dávid Kőszeghy**

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Department:	Department of Applied Informatics
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.....
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.....
vedúci práce

Declaration of Authorship

I confirm that this Bachelor's thesis is my own work and I have documented all sources and material used.

Bratislava May 26, 2015 .....

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I would like to thank my supervisor...

Abstrakt

Tu je text slovenskej verzie abstraktu

Kľúčové slová: *slovo1, slovo2, slovo3, slovo4*

Abstract

In this bachelor thesis we will show you the possibilities of connected cars, options in what advanced services a connected vehicle can provide and how you can do it in the first place. After a thoughtful study of our work anybody with computer science background will be able to build a device which will be capable of advandced services based on his/her needs.

Keywords: *Automotive industry, IoT, Big Data, Embedded device*

Obsah

Introduction

Most of us who watched Knight Rider as a kid expected that by 2015 we would be driving self-aware cars like KITT - cars that would drive us without problems from point A to point B while entertaining us. However we can resort to that this is only partially true, we have successful tries at completely autonomous cars(e.g Google's car) but for ordinary costumer they are not available. What is available is connected cars. Connected cars provide the possibility of internet-based transfer of information. This can be obtained either with embedded devices in car or smartphone. Multiple car manufacturers sell connected cars where different OEM(Original Equipment Manufacturer) devices or applications. These OEMs offer various services which are provided to you when you purchase their car, but there is a small problem. If you are not satisfied with services provided by your manafacturer, the only option you have is to buy someone else product which comes with predefined services. You can not configrue them to the extent as smartphones have apps. It is either you will get used to your OEM solution or go and buy whole solution from somebody else, nothing else. It is like we are stuck in the 90, where software offered to you had come on this particular hardware and you could not choose otherwise. It is 2015 where you can obtain music,movies,applications from various sources that does not limit you to specific hardware, so why on earth we should accept solutions offered by car manufacturers? Imagine you would buy smartphone with predifined set of applications and you could not change them or add new. Today in connected cars what is missing is operating system which would allow costumers to configure their Info-attainment system.So in my thesis I would like to solve problem where when you have car which has no connection or has connection with software you do not like, you could follow my thesis to gain insight into how to connect car and what possible services you can obtain for yourself. In first chapter I will establish some common ground on which we can build foundations of this thesis. Next we can describe the specification of problem which we need to solve and after that show implementation methods and solution to this given task.

1. Overview

1.1 Problem definiton

1.1.1 Problem

IoT is a big field with prospect, probably adding of tens of trillions of dollars to GDP within ten years. The problem which I would like to solve is to show possibilities of connected vehicles providing more safety to the roads, lowering industry expenses on vehicle park, and moreover better services to the end user.

1.1.2 Plan

To tackle this problem first we need to develop embedded device which will enable us to collect data from vehicles. Data can be collected from vehicle's various sources. Our main source of information will be OBD-II service port. OBD-II is industry standard port for gathering information about vehicle state from main ECU, which is mandatory in all gasoline(petrol) vehicles since 2001 and all diesel vegicles since 2003 in European Union. When we have collected data on our embedded device, we need to connect it to the Internet. where we will be able to transfer data to our server. After processing we will create API to be able to build applications on top of our data, which can provide various services to the end user.

1.1.3 Output

To show capabilities of connected car, I have choosen this two applications which will be presented in this thesis. First applicaton will try to increase security of people traveling by vehicle with accident detection and prevention.Accident prevention will alert driver that he is passing through dangerous zone. If accident happens, connected vehicle will send message to the emergency hotline. As for second application, it will be fuel statistic/marketing based application. App will create map of cars having low fuel, ergo there is high chance what they would like to stop at gas station for refill. Owners of that vehicles then could be proposed with marketing option to come refill their tank at advertised station.

1.2 Internet of Things

1.2.1 General Information

The Internet of Things (IoT) is a global infrastructure for further informatization of society, enabling advanced services by interconnecting things based on available technologies. Through identification, data capture, communication and processing capabilities, the IoT makes full use of things to offer services to all kinds of applications. Whilst IoT is a hot topic in the industry it is not a new concept. It was initially put forward by Mark Weiser in the early 1990s. This concept is opening up huge opportunities for both the society and individuals. However, it also involves risks and undoubtedly represents an immense technical and social challenge.

1.2.2 Why is it important?

In my thesis I will connect a thing(car) to the internet so following principles which was set by IoT field will allow me to build better and more secure solution.

1.3 Big Data

1.3.1 General Information

The rise of digital and mobile communication has made the world become more connected, networked, and traceable and has typically lead to the availability of such large scale data sets that the traditional data processing applications are insufficient. As the result new field trying to deal with this problem, have been created which scientists and computer engineers have coined ‘Big Data’.

1.3.2 Why is it important?

When we will have connected car, we will need to collect information, e.g. data. With Big Data approach our solution will be scaleable without need for adaptation if a very big number of devices would be connected.

1.4 Single-board computer

1.4.1 General Information

A single-board computer(SBC) is complete functional computer built on single circuit board. It has microprocessor, memory, input/output and other features depending on the model and manufacturer. Single-board computers are used for educational purposes, embedded solutions and development research/systems.

1.4.2 Why is it important?

Since we will be building embedded device which will allow us to gather data and send them to the Internet, it is necessary to choose a single-board computer which will fit fulfill our needs.

1.5 OBD-II port

1.5.1 General Information

1.6 Accelerometer

1.6.1 General Information

2. Specification

Lorem ipsum dolor sit amet, consectetur adipiscing elit a další text...

V nasledujúcich častiach...

2.1 Podkapitola o zdrojoch

Text s uvedenym zdrojom [2]: Zdroje sa ako bibtex(ten sa da vacsinou rovno stiahnut) pridavaju do textoveho suboru *bibliography.bib* (ktory treba nasledne tiez prekompilovat) a potom sa mozu citovat. Zdroj moze byt napr typu article [1], online link a ine. Pri online linku [3] treba uviest datum citovania, ten sa nastavuje v subore *fmph.bbx* a pri online zdrojoch sa potom uz automaticky vypise.

2.1.1 Este mensia podsekcia - zoznamy

Zoznam poloziek:

- **prve** – popis
- **dalsie** – Aliquam erat volutpat. Proin vel mi aliquet, dignissim metus quis, elementum lectus. Quisque ac est enim. Interdum et malesuada fames ac ante ipsum primis in faucibus.
- **este nieco dalsie** - dalsi popis

Číslovaný zoznam:

1. **Analýza dát**
2. **Niečo dalšie**
3. **Ešte niečo**
4. **Aby toho bolo viac**

2.1.2 Este jedna - obrazky vedla seba

Obr. 2.1: Dva obrazky so spolocnym popisom a vlozenou horizontalnou medzerou medzi obr

Obr. 2.2: Popis obrazku s mensim fontom popisu ked mam priiilis dlhyy popis velky ako odsek a uz by sa to bilo so zvysnim textom tak nech to odlisim ze je to popis

vlozeny vacsi vertikalny priestor medzi obrazkami

Obr. 2.3: Dalsi obrazok s velkostou fontu popisu ako ostatny text

2.2 Ina podkapitola

a dalsi mudry text

2.2.1 A v nej subsekcia

3. Návrh - ako vložiť ukážku kódu

farby a dalsie klucove slova na zvyraznenie sa daju urcit v definicii lstset ktora je v main.tex nasleduje nieco ako JQuery....

```
(new MojObj());         //vytvorenie
MojObj = function() {
  var prem1 = [];
  var bool = 0;
  var construct = function() {
    var prem1 = $('#id').find('div');
    prem1.each(function() {
      prem1.push(new obj(this));
    });
    $(document).click(nejakaFunkcia);
  }
  var funkcia = function() {
    for (var i in prem1) {
      if ( bool ) { //tak nieco sprav
      }
    }
    bool = !bool;
  }
  $(document).ready(construct);
};
```

Momentalne je lstset nastaveny na jazyk PHP, tak automaticky zvyrazni syntax aj bez pridavania klucovych slov
ukazka php kodu

```
<?php
function randomcode() {   //komentarik
  $var = "abcdefghijkmnopqrstuvwxyz0123456789";
  srand((double)microtime()*1000000);
  $i = 0;
  while ($i <= 7) {
    $num = rand() % 33;
    $tmp = substr($var, $num, 1);
    if (isset($code))  {
      $code = $code . $tmp;
    }
```

```
    $i++;
  }
  return $code;
  }
?>
```

4. Záver

Cieľom diplomovej práce bolo...

V práci som.....

Ďalší možný rozvoj....

Zdroje

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[3] FRY, Ben. 2001. *Mapping how people use a website, Mappa.Mundi Magazine*. [online]. : media.org, 2001. [cit. 8.4.2013]. Dostupné na internete: `http://mappa.mundi.net/maps/maps_022/`.

Prílohy

CD obsahujúce:

- Elektronickú verziu
- Zdrojáky
- atď