



Final Presentation - PIC

IntelliPark



Our team Intellipark developed a project, which searches to solve day to day problems to drivers, more specifically drivers who search for parking spots in areas of high vehicle density, more precisely in open areas.

A person wearing a white button-down shirt is shown from the chest down, pointing their right index finger towards a smartphone held in their left hand. The background is a soft-focus white.

Introduction

Smart Street Parking System

Parking in busy cities is often chaotic:

- Limited parking spots available for the large quantity of vehicles.
- Unknown status of parking spots

This results in :

- traffic congestion
- Stress
- waste of fuel

Through our solution we search to bring a reduction of all these annoyances.



Problem

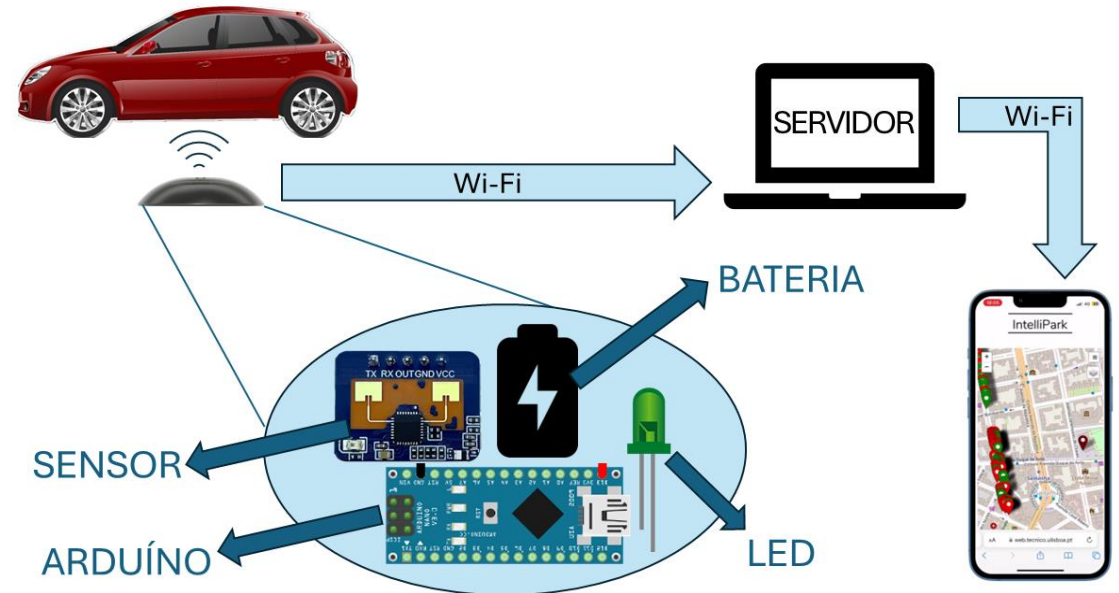
Smart Street Parking System

Solution (Block diagram)

Intellipark developed an innovative solution, where a sensor is placed in the ground and awaits for a car to pass over, so it can be detected.

As shown in the image to our right, the sensor is connected to an Arduino, who communicates with our server through a preconfigured Wi-Fi network, who then transmits data to our webapp, allowing it to display dots that symbolizes parking spots.

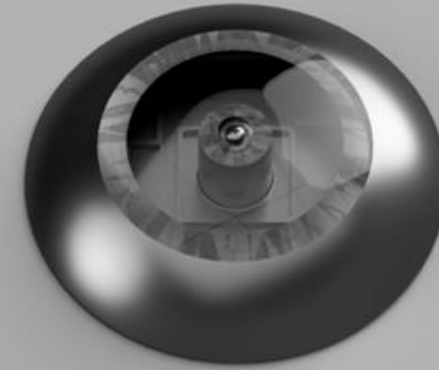
In the next slides we will explain with detail these element.

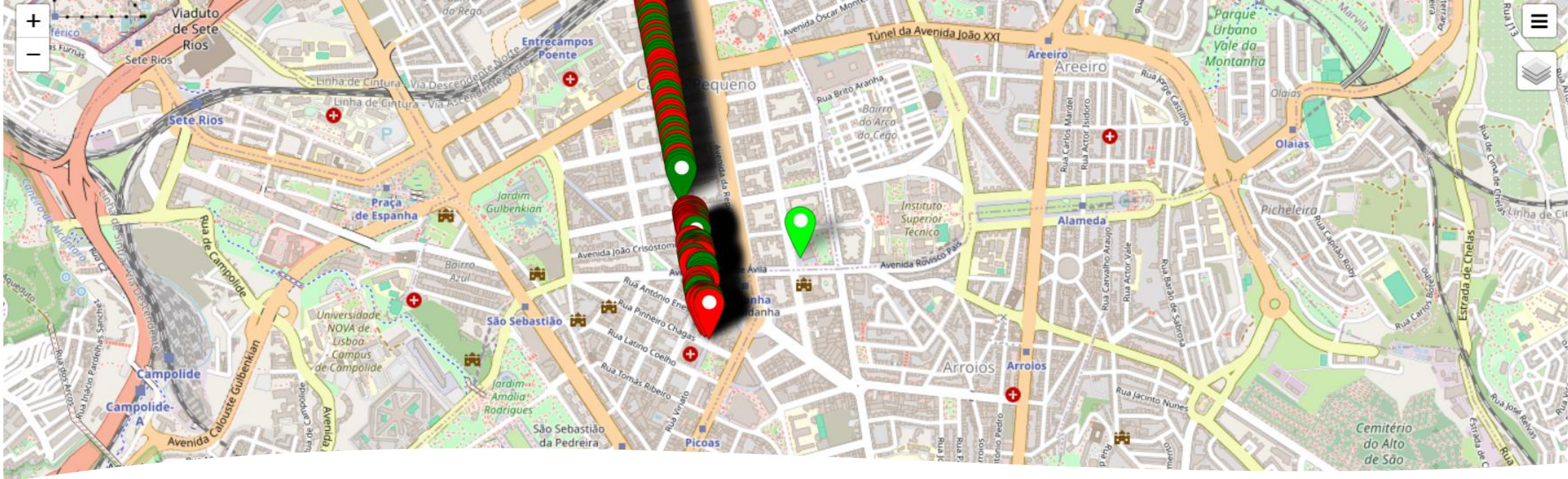


Solution (sensor)

The sensor used for this proof of concept was the HLK – LD2410C (a proximity sensor):

- The sensor has a detection range of 0.1cm to 40cm;
- The sensor has an angle of detection of 60°;
- The case was built through 3D printing;
- The sensor works through battery, as well as, micro-usb;
- The size of the sensor is that of 17,5cm of diameter and 4cm of height;
- The sensor is connected to an Arduino who then transmits to a network Wi-Fi preconfigured and transmits data do our webapp.





Solution (webapp)

Intellipark developed a webapp, which eases everything the user needs through :

- Presents multiples parking spots showing their availability through a simple color code: Red occupied or Green when is free;
- By clicking dots in the map more information is showed, allowing you to be redirected to google maps where the coordinates to the parking spot will show and allows the user to establish a route;
- Website link: <https://web.tecnico.ulisboa.pt/ist1103409/>.



Recipients and Beneficiaries

- EMEL - Work reduction
- Drivers in urban environments - accessibility to parking spots
- Urban Planners
- Companies who might need this information
- Locals – easier access to road

Competitors



Libelium is a company which developed a sensor that provides the information of the availability of the parking slot through Lorawan connection, however it detects through changes in the magnetic field which has more area of error.



IntelliPark

Our sensor has a major difference which consists in communicating via wi-fi. This solution provides a high data rate being the information transmitted quicker. However, it requires more power consumption. Moreover, we use a millimetric radar sensor which is more accurate.

After testing, our sensor was able to achieve the following:

- Detect vehicles within a range a of 40 centimetres;
- Detect vehicles through invisible objects;
- Read the information from the sensor to the Arduino;
- Ensure the communication between the sensor and our webapp;
- Limit the angle of detection by placing aluminium inside our cover of the sensor (avoiding the detection of vehicles in adjacent slots).



Division of labour

Francisco Santos	Guilherme Garcia	Guilherme Santos	João Coutinho	Daniel Borges	Catarina Sebastião
Code development for Arduino	Website development and update	Webapp development	Emel contact	Hardware assembly	Coordination and organization of individual tasks
Arduino communication	Sensor configuration	Arduino communication	Advertising video elaboration	Sensor configuration	Poster, Website development and update, advertisement

Main sensor metrics:

- Latency (approximately 0,5 ms)
- Range (40cm)
- Voltage consumption 3.3 V
- Size 22x16mm

Arduino metrics:

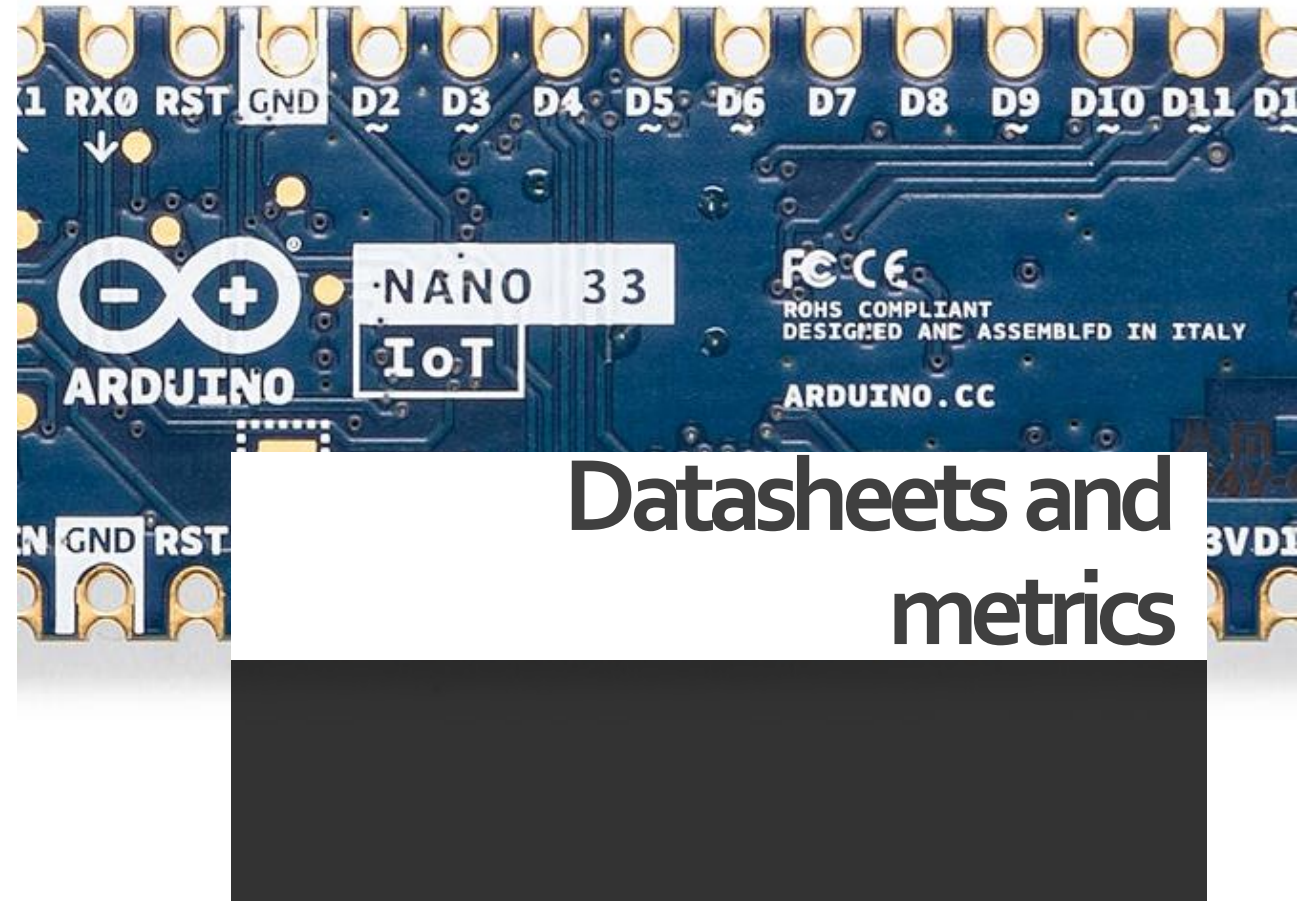
- Latency (very low, cannot be measured)
- Wi-Fi communication (fast)
- Size 45x18mm
- Alternative power supply

Datasheet of the sensor :

<https://www.tinytronics.nl/en/home-automation/sensors/motion-and-presence/hi-link-hlk-ld2410c-24ghz-radar-sensor-module-with-bluetooth>

Datasheet of the Arduino Nano 33 IoT:

<https://store.arduino.cc/products/arduino-nano-33-iot>



Datasheets and metrics

Our team



Francisco
Santos



Guilherme
Garcia



Guilherme
Santos



João
Coutinho



Daniel
Borges



Catarina
Sebastião

Costs and Benefits

Costs

The production of the sensor performs a total cost of 45€, considering all the equipment used:

- Arduino Nano 33 IoT: 27€
- Sensor: 10€
- Battery: 5€
- Other material: 3€

Benefits

- With Intellipark, the common urban driver will be able to know the availability of a specific parking slot just by searching it in our webapp with no delay.
- Everyone can use the webapp, there is no need to download or give personal information and it is really easy to learn how to use it. The users, mainly urban drivers, will be able to save time finding a parking slot which will also reduce the fuel waste.



Thank you!

Intellipark 

intellipark.ist@gmail.com 

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