SMART FORKLIFT

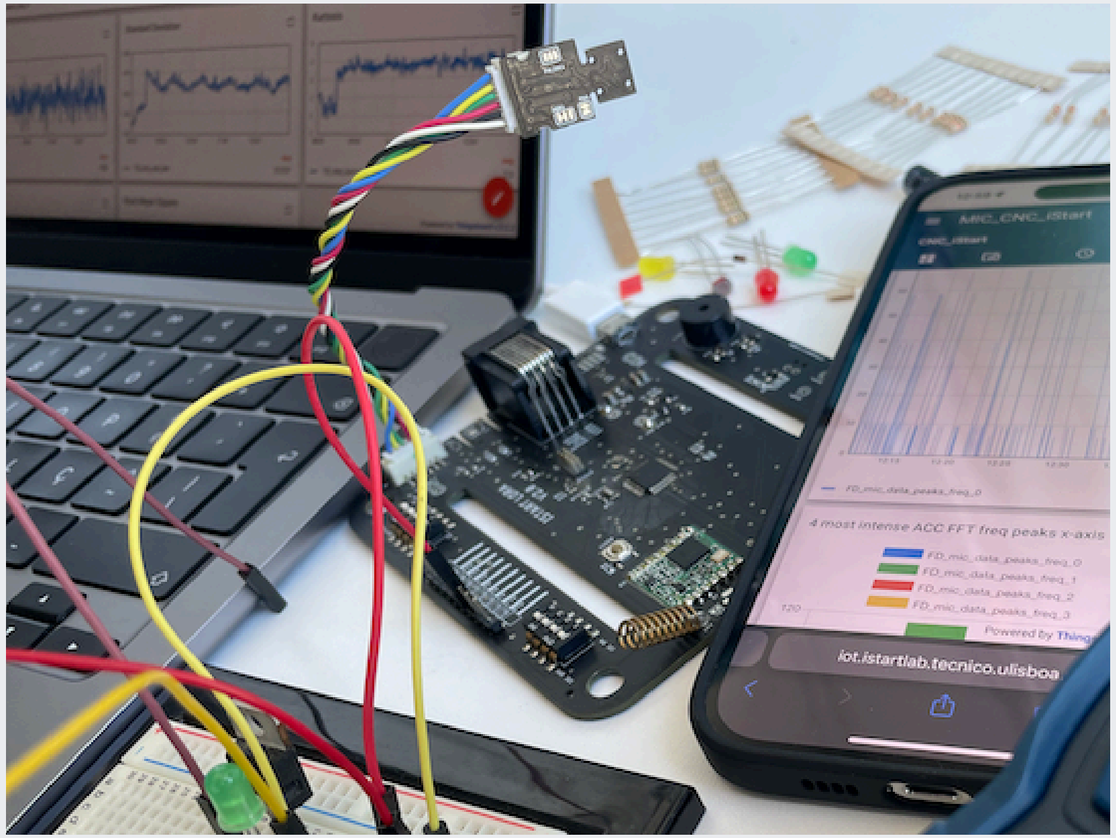
ELETROCAP PROGRAM PITCH DECK

Alexandre Marques | Ana Mendes | Bernardo Costa | José Paradela | Luís Santos | Miguel Dias

INTRODUCTION

The ElectroCap Program is part of the Integrator Project Course in Electrical and Computer Engineering (LEEC) and its main objective is to create conditions to make the most of the concepts acquired over the last few years in solving a real problem or challenge.

Basically, our goal is to make a intelligent forklift using some innovative technologies, as a way to minimize errors and increase warehouse productivity.



TEAM

We are a group of six third-year students studying Electrical and Computer Engineering at Instituto Superior Técnico, in Lisbon, Portugal.






ADVISORS AND MENTORS

Prof. Duarte
Mesquita e Sousa

Eng. João Garcia

PROBLEM

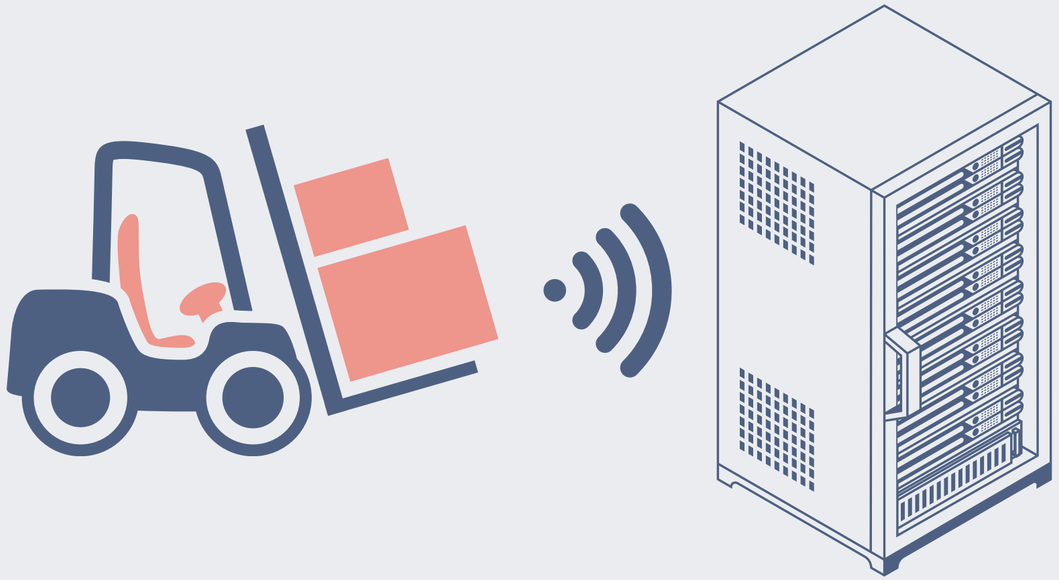
Stock management in warehouses is made manually and is subject to several mistakes. Better organization in real time would reduce errors and waste.

The problem we are trying to solve is the human error in the process of registering the items in stock into databases, both in quantity and in location. There are some systems that solve some of these problems but are singular to each problem and considerably expensive.

TECHNOLOGICAL SOLUTION

Develop a system that can calculate the number of items through their mass (weight), using sensors that measure the energy used by the forklift to elevate the products and some software to calculate mass.

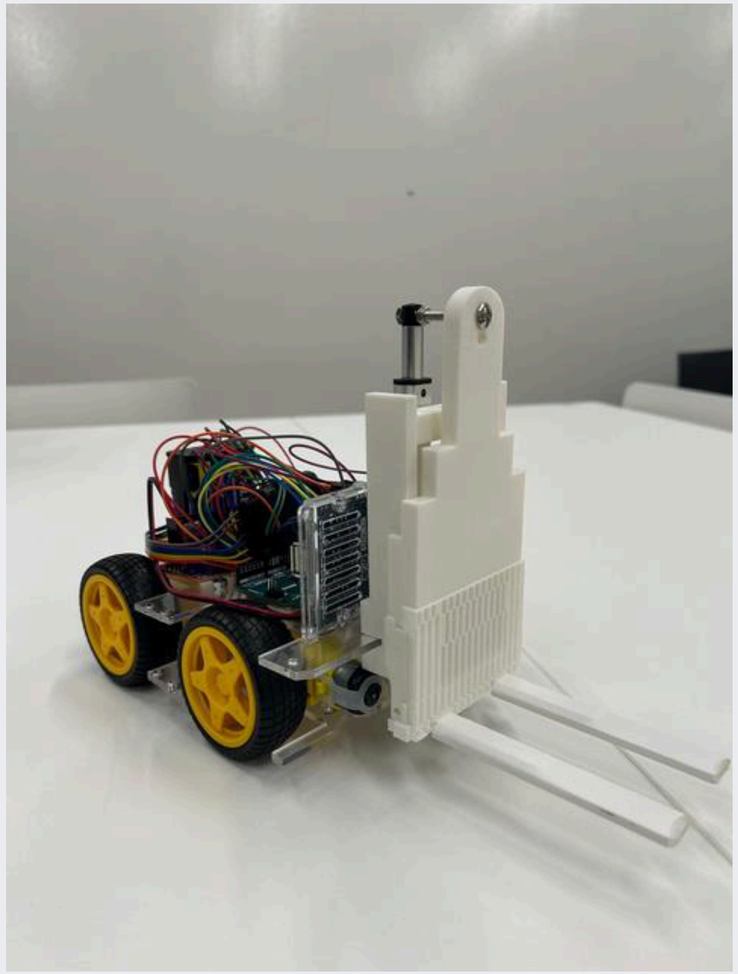
Send all these data into companies databases, in their standard format.



PRODUCT AND SOLUTION

The first thought was to build a mini forklift so that it could be shown on Demo Day, where it would have the basic functions of a forklift and the ones related to the problem and the solution proposed.

The ability to calculate the total weight that the forklift is carrying was one of the most important features implemented. The mass can be calculated using the power that the actuator exerts when lifting the products.



PRODUCT AND SOLUTION

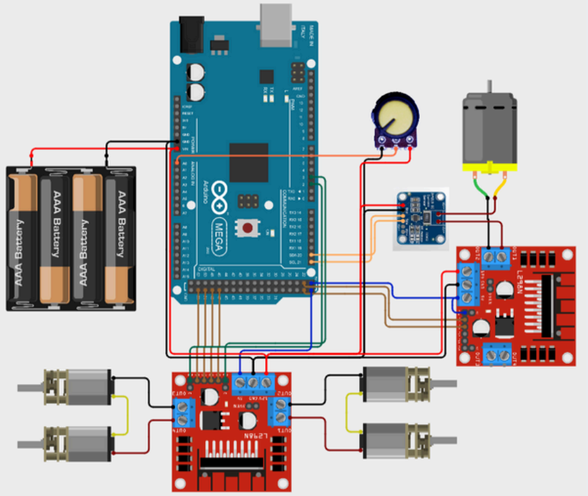
An application was also made to read product bar codes.
Two functionalities were implemented. One reads the product bar code so that our program can identify the product it's working with. The other is used when the product isn't already present in the database and adds it with the necessary information for future calculations: product name, unitary weight and its bar code.

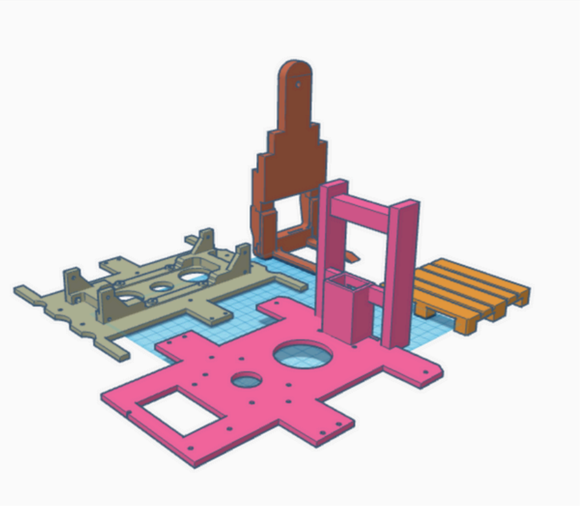
RESULTS

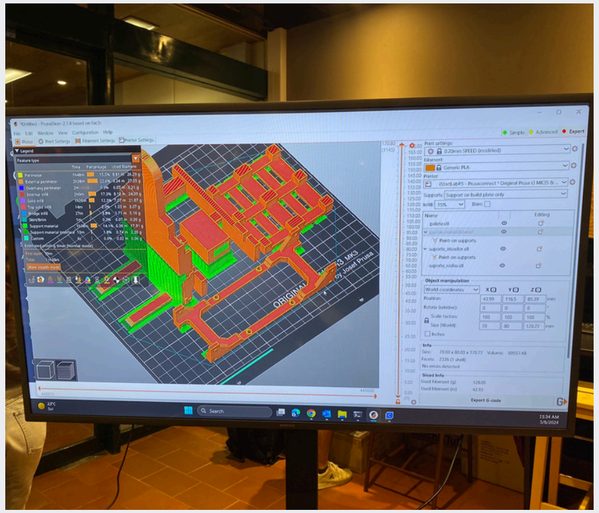
During the time we had to work on this project, we were able to get most of the results expected from the beginning and some great exemplifications of how it evolved.

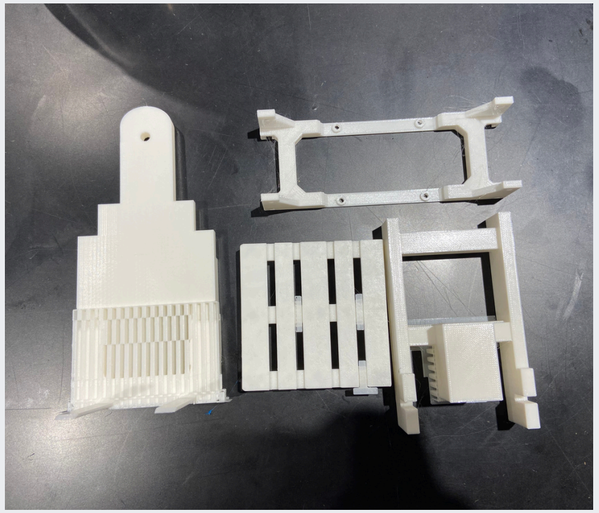
The first step where it's possible to see real results was the initial circuits drawing.

After that, the next important development was the 3D modelling of the parts to be printed or laser cut.
Shortly after we had in hands the 3D printed results.







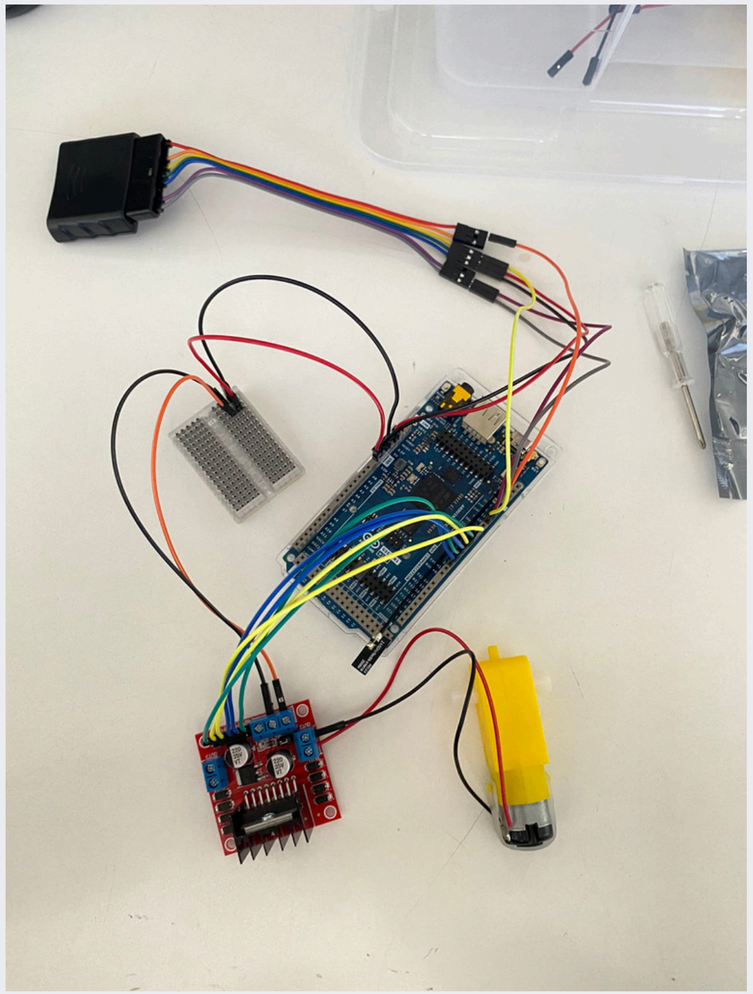


RESULTS

With most of the material already in hand, the 3D and acrylic pieces ready, we could finally assemble the components together to see the mini forklift start to take form.

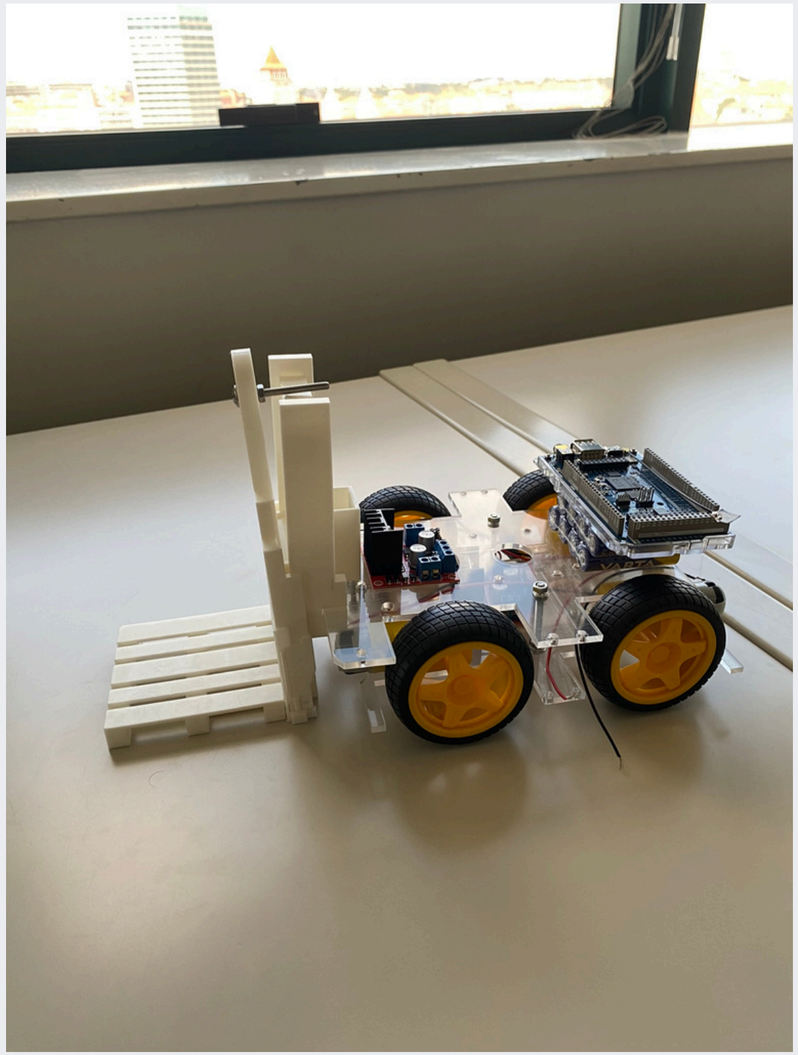
In this phase, we could already test the movement of the robot with the PS wireless controller.
Later on, with the arrival of the actuator, we could implement all the functionalities that the PS controller would take care of.

Meanwhile, the connection of the mobile app with the Arduino was being implemented and successfully tested.



RESULTS

The final step is the connection of the app, the database and the mini forklift showing the functionalities of our product, mainly the count of product units being lifted.



COSTS AND BENEFITS

Since the main functionality of our product is the calculation of mass through the power, it requires less hardware and is more based on software than our competitors. This way it can be more affordable than the calculation through weight sensors or balances that some competitors might use. Like this, we can differentiate ourselves and provide a more cost-efficient solution.

In this initial prototype, we have created a simple database for demonstration but in some final versions of the product, since the work with the database is minimal, it is possible to implement the functions we need in the existing database of the company, as we only need the information of the number code of the product and single weight and this data is already commonly present in the needs of every company.

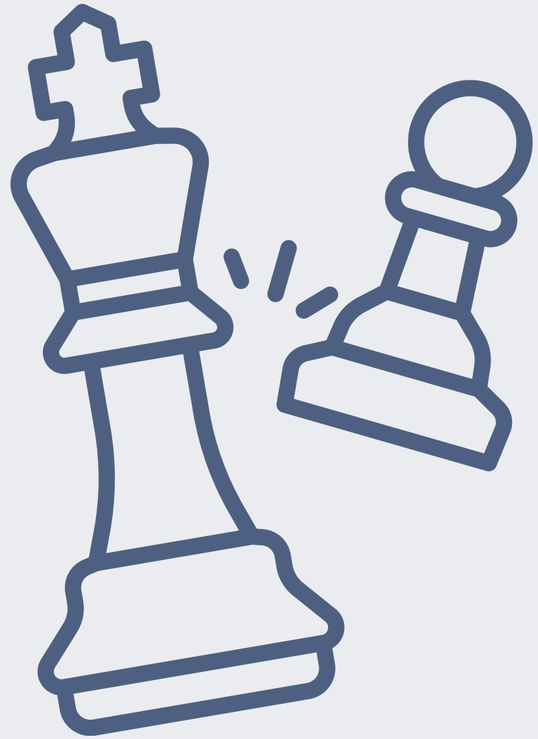
We can provide a simple and easy transition for companies, which sometimes is a major factor in decisions in the implementation of new technologies in the existing workflow of the warehouse.

SOLUTION BENEFICIARIES

Our solution can be applied to companies with warehouses and their workers, increasing productivity and saving time.
The most beneficiary situation are companies that handle big quantities of only a few products. This way, the time workers spend verifying the product counts is minimal while making use of all the advantages our solution provides.

COMPETITORS AND PREVIOUS WORK

This kind of product has been thought in some different ways by other companies like Rocla, Körber and Kaiserkraft. The previous developments in this area are AGV robots and Pallet trucks with precision scale. In one or another way they have similarities with our product, but none of these are the same.
These companies implement today's technology in the forklift market but in a different way. Some might be more towards moving the forklift autonomously, others more towards optimizing logistics inside the warehouse, but none do the calculation of mass and eventually the number of products in the pallet like ours.



CONTRIBUTION OF EACH MEMBER

The organization of work was mainly done by which part of the work each member felt more comfortable working and this way we found ourselves working in each one's most valuable area to contribute.

- Alexandre Marques contributed mostly in the area of database, mobile product reading application and video presentation.

- Ana Mendes was responsible for the poster, helped in every other area with visual content, did the calculation of mass using equivalent power/resistance system and helped with the forklift mechanism.

- Bernardo Costa worked on the movement of the robot, coding and the final pitch deck.

CONTRIBUTION OF EACH MEMBER

- José Paradela developed the code responsible for the elevation of the forklift forks through the actuator, the product count program and the calculation of mass using equivalent power/resistance. Also made significant progress in the database.

- Luís Santos was responsible for the structure of the prototype, making the 3d design of parts to be printed in a 3d printer and acrylic plates to be cut with a laser. With all these parts it was possible to assemble the entire forklift with the help of some screws and tape holding it together.

- Miguel Dias was the one doing the exterior communication, scheduling the reunions with the coordinator, controlling the list of materials needed and updating the website. Also helped in mounting the prototype with all the materials.

Apart from this, it is possible to say that every member helped with the other's tasks at some point.

WEB LINKS

Blogue

- https://smartforklift.webflow.io

Site

- https://youtu.be/_c1uKAisRsQ