Autonomous oriented solar panel - THE SUNFLOWER

Low-tech with Refugees - Low-tech & Réfugiés

https://wiki.lowtechlab.org/wiki/Panneau_solaire_%C3%A0_orientation_autonome_-_LE_TOURNESOL/en

Dernière modification le 30/07/2024

Difficulté **Difficile**

Durée **20 jour(s)**

Coût **50 EUR (€)**

Description

"The Sunflower" ⚡ Inspired by the concept of the sunflower, which changes direction according to the position of the sun. This project is a precursor to a larger project. The idea of this project is to maximise exposure to the sun by changing the direction and inclination of the solar panels according to the position of the sun. This is done using programmable servomotors controlled by a microprocessor.

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Introduction

This project is divided into 3 parts: mechanics (the most difficult), programming and electronics.

- **The mechanic part :**

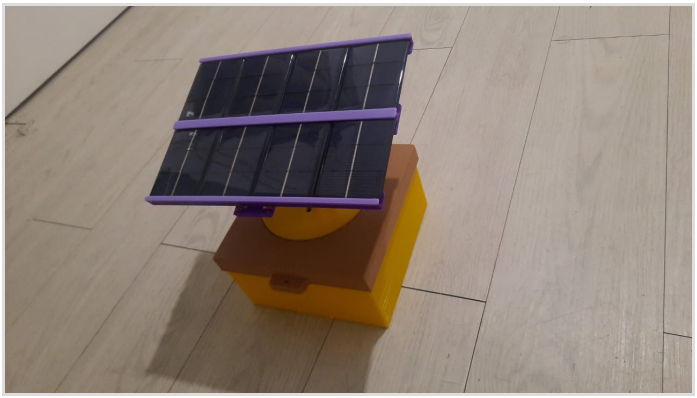
First of all, we made a sketch of the mechanism for this project, then we used CATIA V5 to design the 23 parts of the project. We then used PrusaSlicer to 3D print them using PLA filaments. This is the most difficult part, because we need to know exactly how the mechanism will work. So we bought 8 solar panels, 2 servomotors and rechargeable batteries. Finally, we put it all together.

- **The electronic part :**

We used rechargeable batteries of 1.5 V each, connected in series to give 12 volts. We then connected these batteries in parallel to the solar panels, of which there are 8, which also gives us 12 volts. In addition, 4 of the batteries power the STM32 microprocessor, and from the STM32 we power the servomotors.

- **The programming part :**

After studying the chronology of sunset and sunrise in Brest over 365 days, we obtained the time difference between them (in minutes) and noted the variation in sunset and sunrise times throughout the year. For example, we found that the duration of sunshine increases each day until the 173rd day, then decreases until the end of the year, each day increasing/decreasing by 2.7 minutes.
In addition, the servomotor that controls the rotation of the solar panel supports changes direction every day from 0 to 180 degrees. However, the servomotor that controls the tilt follows the movement of the sun, depending on the year.



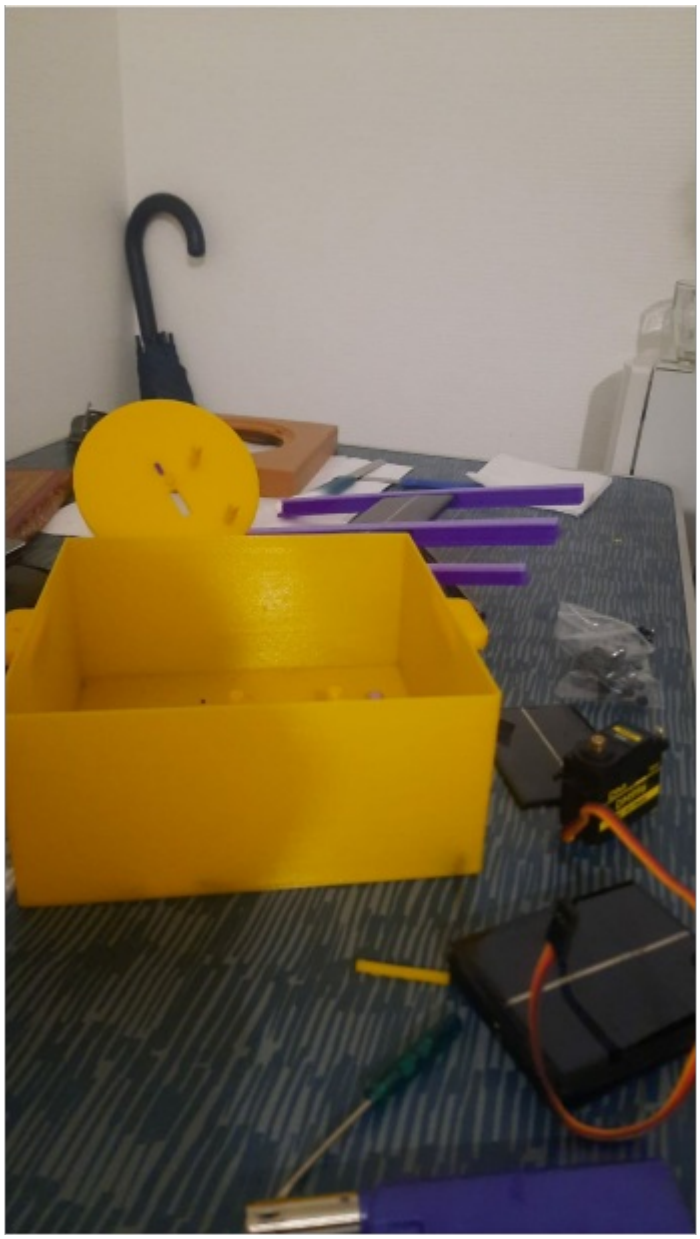
Matériaux

3D Printing

Outils

Nous used PLA filaments to print all the existing parts. We also bought 2 servo motors, 8 rechargeable batteries and 8 solar panels.


80X60



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- Panneau_solaire___orientation_autonome_-_LE_TOURNESOL_fixScrew2.stl
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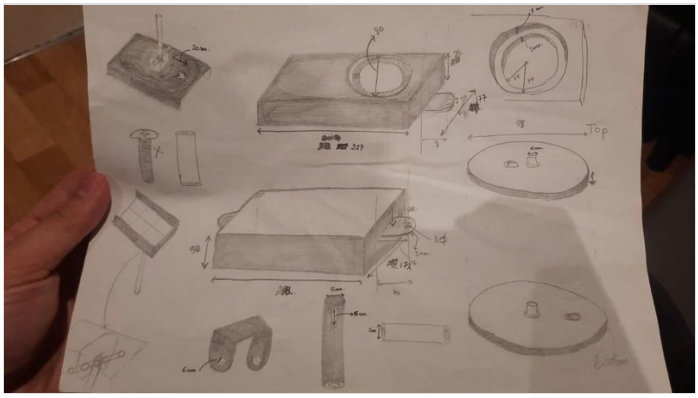
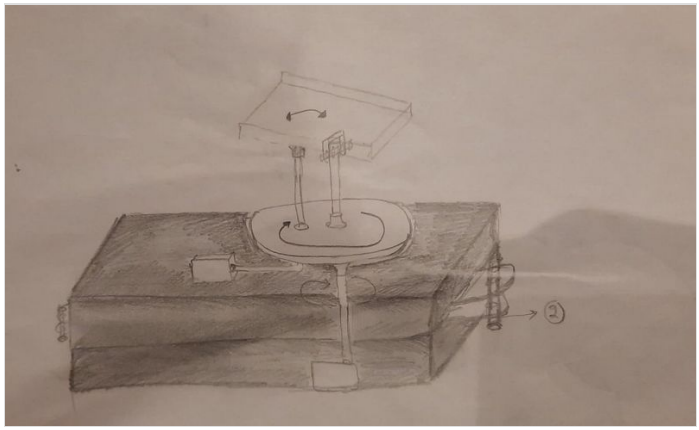
- Panneau_solaire___orientation_autonome_-_LE_TOURNESOL_upperpart.stl

Étape 1 - 1 Sketch

✏ **In the first stage: Sketch**

we drew a sketch to visualise the mechanism so that we could start with a more finished form.

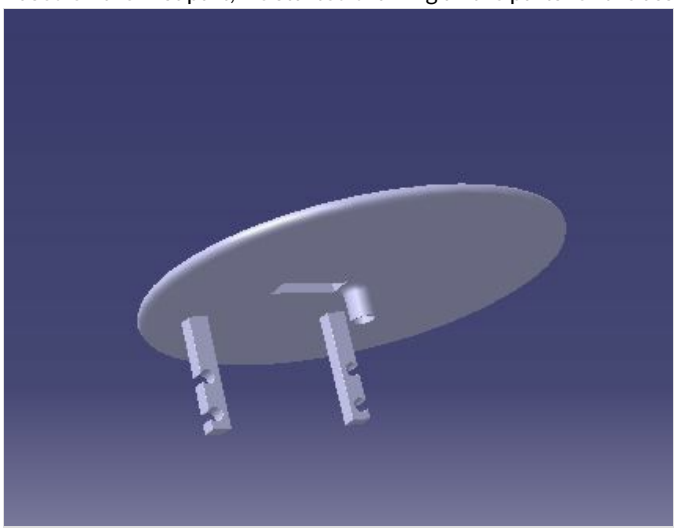


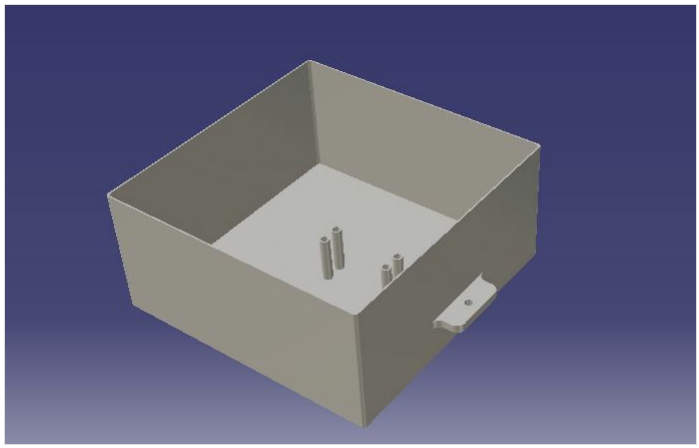


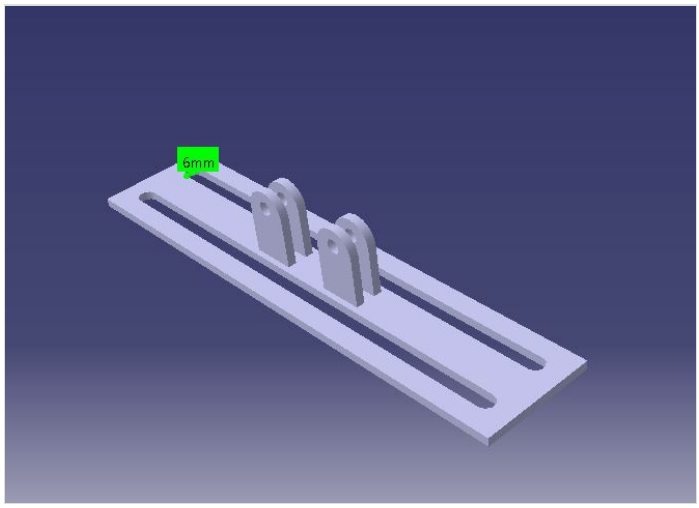
Étape 2 - 2 Drawing Catia

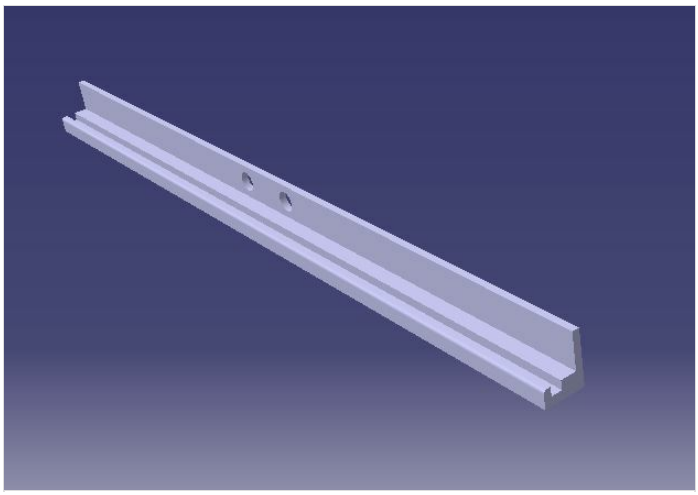
In the second stage: drawing the parts on CATIA V5.

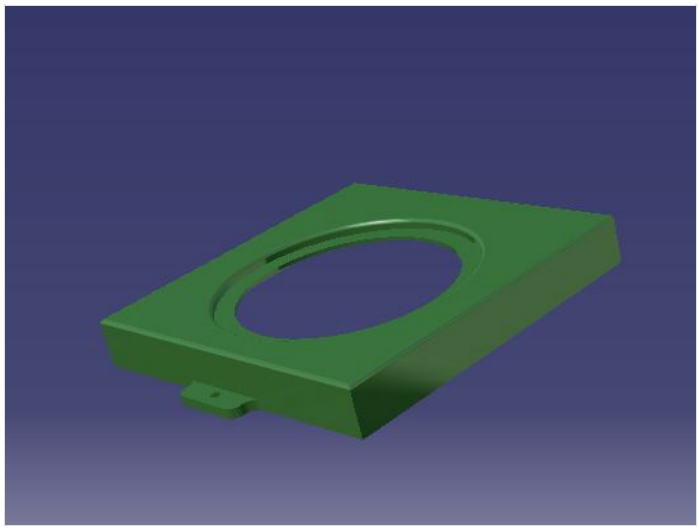
Based on the first part, we started drawing all the parts for the assembly.

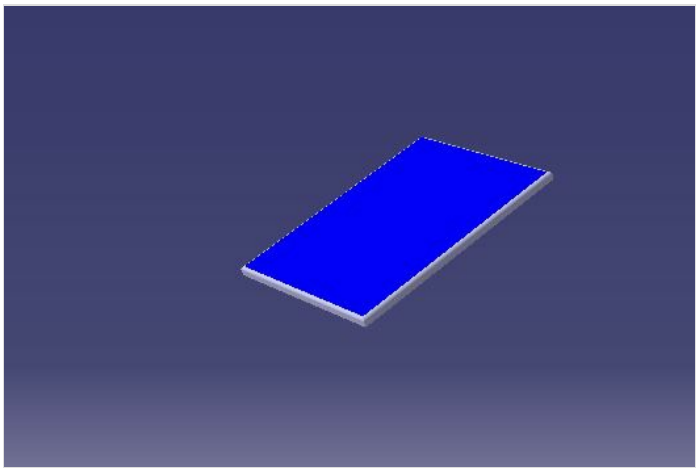








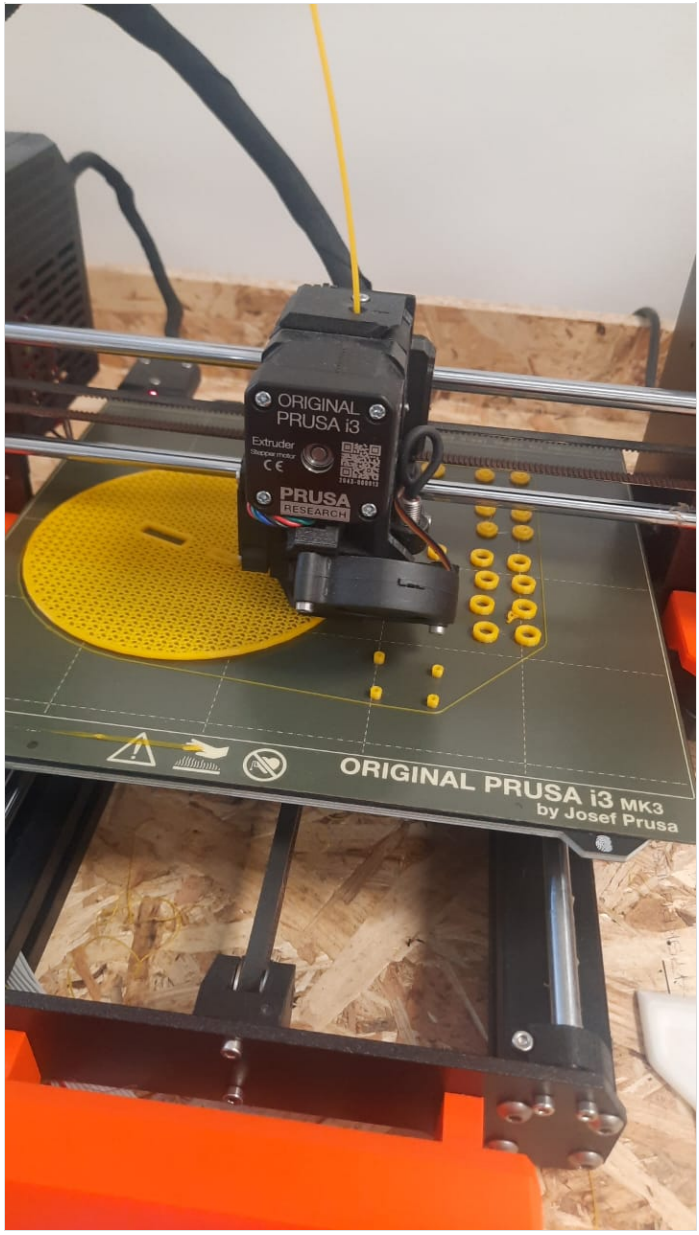




Étape 3 - 3 3D Printing

In the third stage: 3D printing.

Once all the parts have been completed, we print all the important parts for the mechanism.
https://wiki.lowtechlab.org/wiki/Fichier:Panneau_solaire_orientation_autonome_-_LE_TOURNESOL_Printing_3D_video.mp4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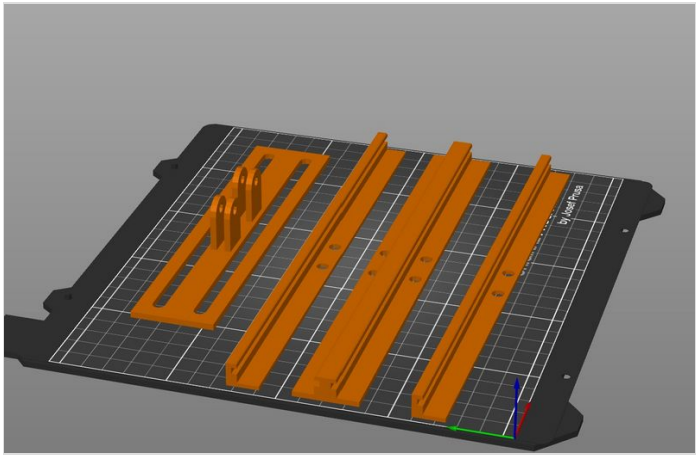
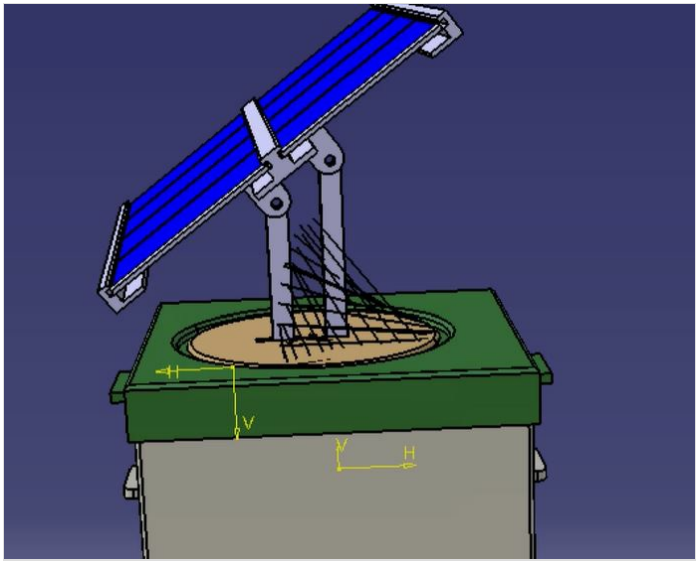
PRUSA i3
Extruder
PRUSA
RESEARCH
ORIGINAL PRUSA i3 MK3
by Josef Prusa

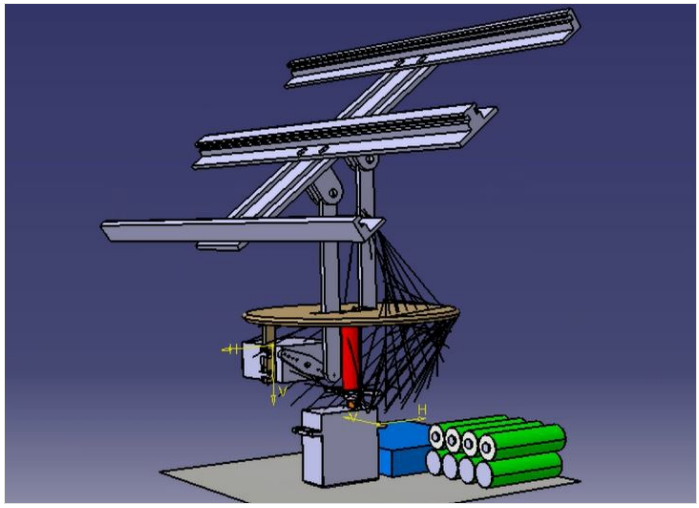


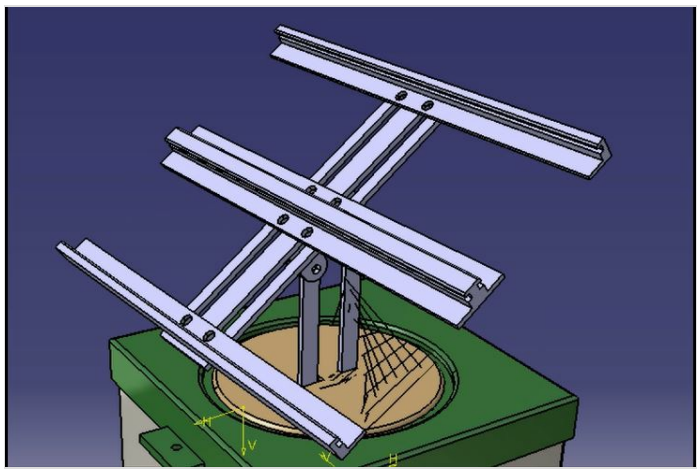
Étape 4 - 4 Assembly

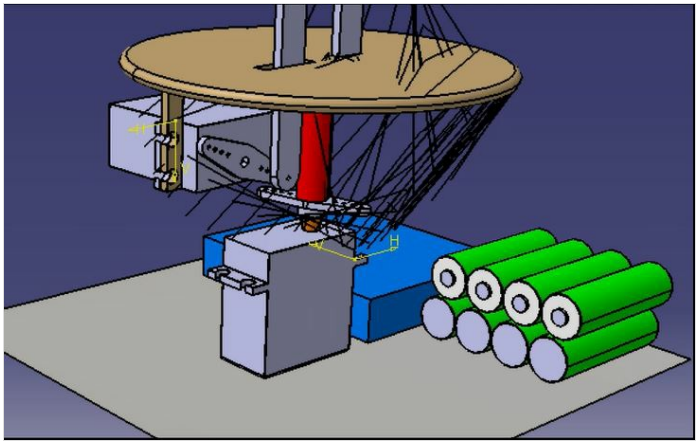
In the fourth stage: Assembly.

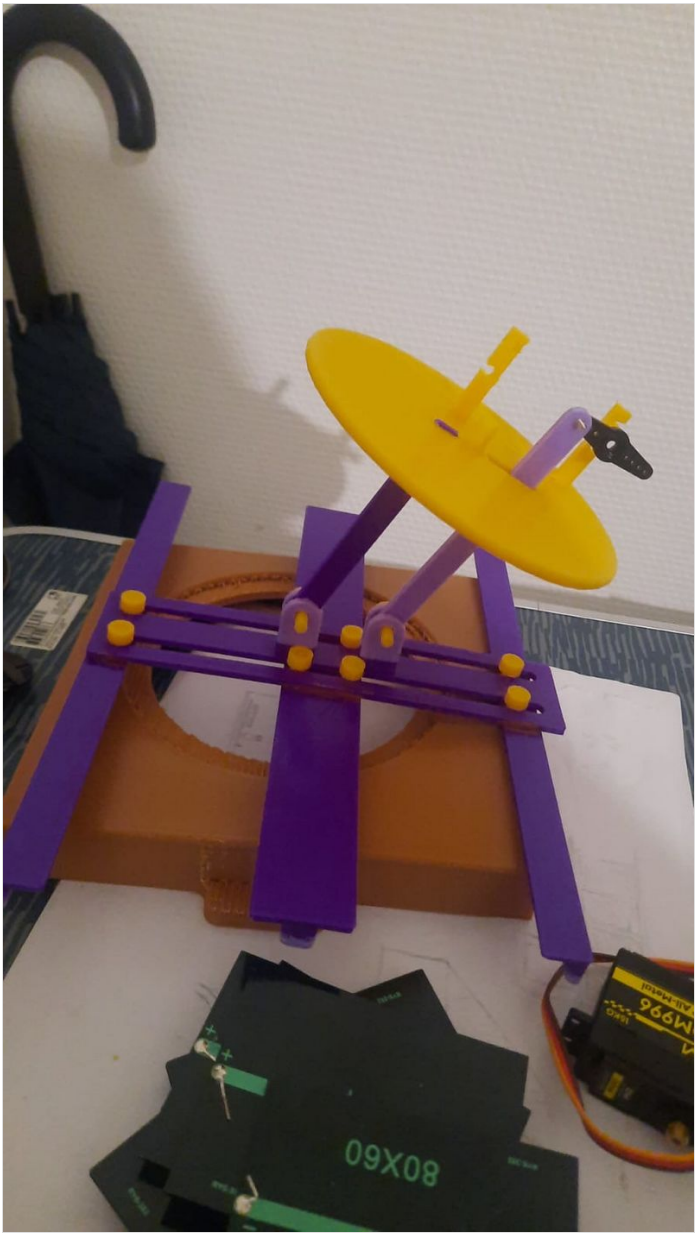
We proceed by connecting all the parts to create the mechanism.











https://wiki.lowtechlab.org/wiki/Fichier:Panneau_solaire_orientation_autonome_-_LE_TOURNESOL_Video_manually_on_how_the_inclenation_will_works.mp4

Notes et références

 The mechanism works well.
 We didn't have enough time to work on the programming and electronics part.

This project is considered a ‘low-tech’ project because it aims to use simple, accessible and sustainable technologies to solve specific problems, in this case maximising the energy efficiency of solar panels. The term ‘low-tech’ refers to solutions that are often less expensive, easier to repair and maintain, and which reduce reliance on complex and expensive technologies. This project uses mechanical principles and proven technologies, such as servomotors and solar panels, combined in an innovative way to track the position of the sun, similar to the natural behaviour of the sunflower. This approach promotes sustainability, resource efficiency and accessibility, in line with the principles of low-technology.