

Week(1) | Research | Software Sub-Team

- We had our first meeting as a team on the 9th of October 2022 -offline-, we discussed the general idea of the project and brainstormed different approaches we would take. During which we settled on dividing ourselves into small sub-teams to have enough research on each part.
- The sub-teams were: Mechanical Design and Solid Works, Momentum Wheel, Simulation and Software.
- At this point, we agreed that the approach the project would take will be decided by mechanical design and momentum wheel sub-teams.
- A week later and on the 16th of October 2022 we had our second meeting -online- to discuss research results.
- Here we had different scenarios to apply:
 - 1) Work on the original model (bike with a robotic arm on it), but then we'll have to wait till the suitable encoder for the reaction wheel is available at local stores which wasn't of high chance to happen and at high risk for the whole project to fail.
 - 2) Divide the project into 2 robots; one for the self-balancing bike and another for the robotic arm, but the simulation would be on the original model; bike with an arm on it and no simulation for the physical model.
 - 3) Divide the project into 2 robots; one for self-balancing with two wheels next to each other (like a hoverboard) and another for the robotic arm placed on 3 wheels.
Assuming there was enough time after finishing such a model? We would do research on the original bike with an arm model but just simulation.
- We settled on the 3rd model. The first one was of a high risk and time wouldn't be enough to start all over again in the middle, second had the same encoder problem so half the project is at risk, third was just combining all together.
- Finally, we divided ourselves again into sub-teams to start actual work, Solid Works sub-team to start modelling the self-balancing robot then the robotic arm respectively and Software sub-team to start writing full demo codes to test a week or so later. For the hardware wirings we would do it all together when project parts are there on ground.

Software-Specific:

- Research week was basically getting a taste of all project parts, understanding what PID controller is as a mathematical tool as well as physical meaning and how to tune it, searching different sensors and on top of them MPU6050 and how to manipulate its readings inside your code, interfacing with motor drivers and all electrical components.
- Since we settled on third model for our project, now software codes would be divided on 2 microcontrollers (ESP32), one on the self-balancing hoverboard-like robot and another for the robotic arm on three wheels robot.
- For the self-balancing one we'll work on the PID Controller part, and for the robotic arm we'll work on gripping objects, avoiding obstacles and line-following, all using a mobile app(flutter); one for each robot.
- We might add an image processing part through laptop camera but this is to come later.
- More tasks are to be brainstormed.