Developing A Control Unit for Gait Motion Simulator

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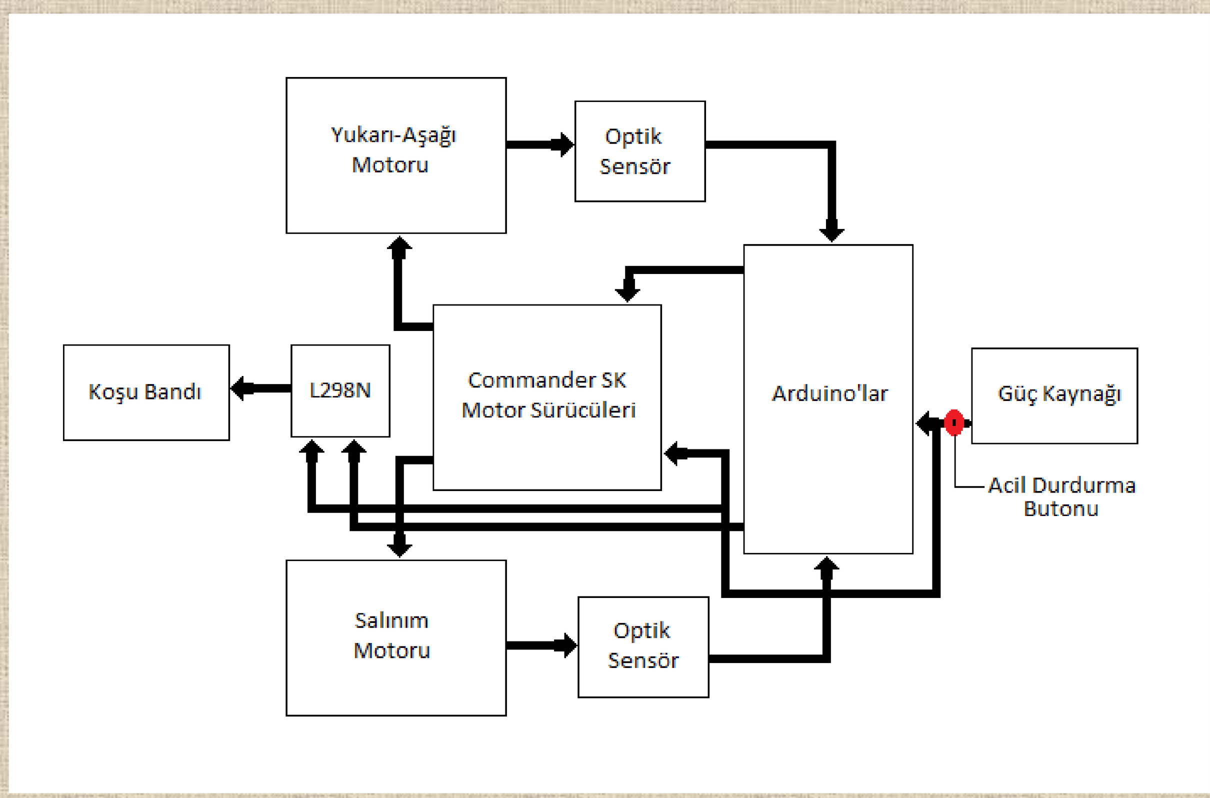

Figure 1: Diagram of the System

Figure 2: Prototype

Introduction

In this study, it was aimed to organizing all the components of the system and making it a system that everyone can understand and work on when necessary, add a control mechanism to this gait simulator that was already designed in previous periods. Until the outbreak of COVID-19, this was the case, and project under the outbreak has evolved to another state. After the epidemic, studies on control mechanism had to be abandoned and instead it was decided to model the entire system via MATLAB Simulink program. The results seen in this poster contain information on the systematization and modeling of the entire structure of the simulator.

Solution Methodology

In the first part of the Project, improving the system understanding was the most important parameter. Before improving the existing system, some literature searches were carried out on gait simulators, control systems and motors. After that, the system was dismantled piece by piece, the tasks of the system parts were determined, analyzed. Various ways were then considered to prevent disorder and cable clutter. The analyzes are presented as the map of the entire system can be seen in Figure 4. As a result of these studies, the PCB designs you see in Figure 3 were obtained. Thanks to these designs, both irregularity was minimized and unnecessary cables were eliminated.

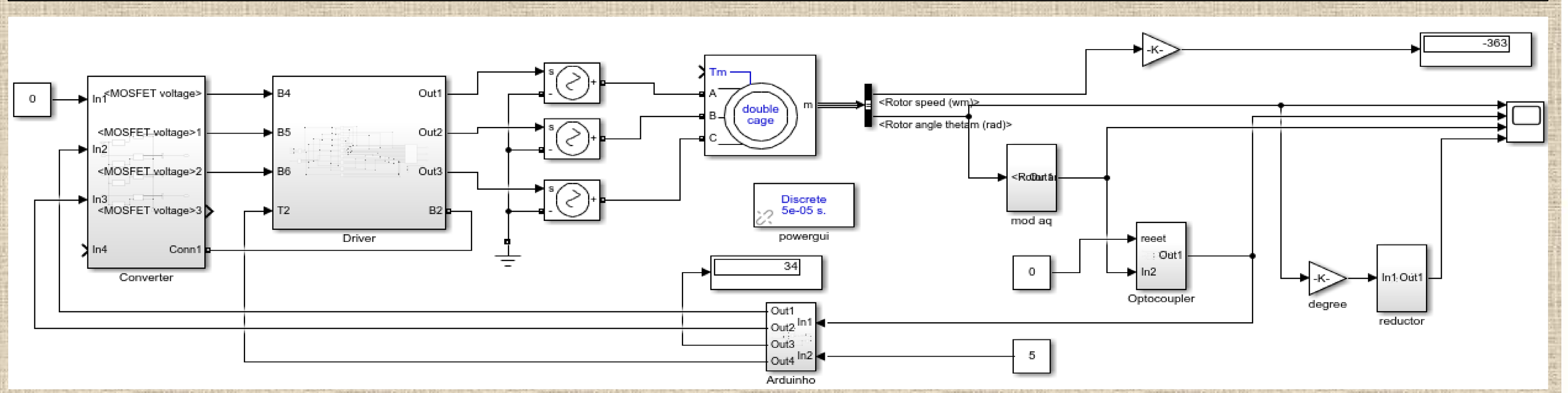

Figure 5: Modelling of the System on Simulink

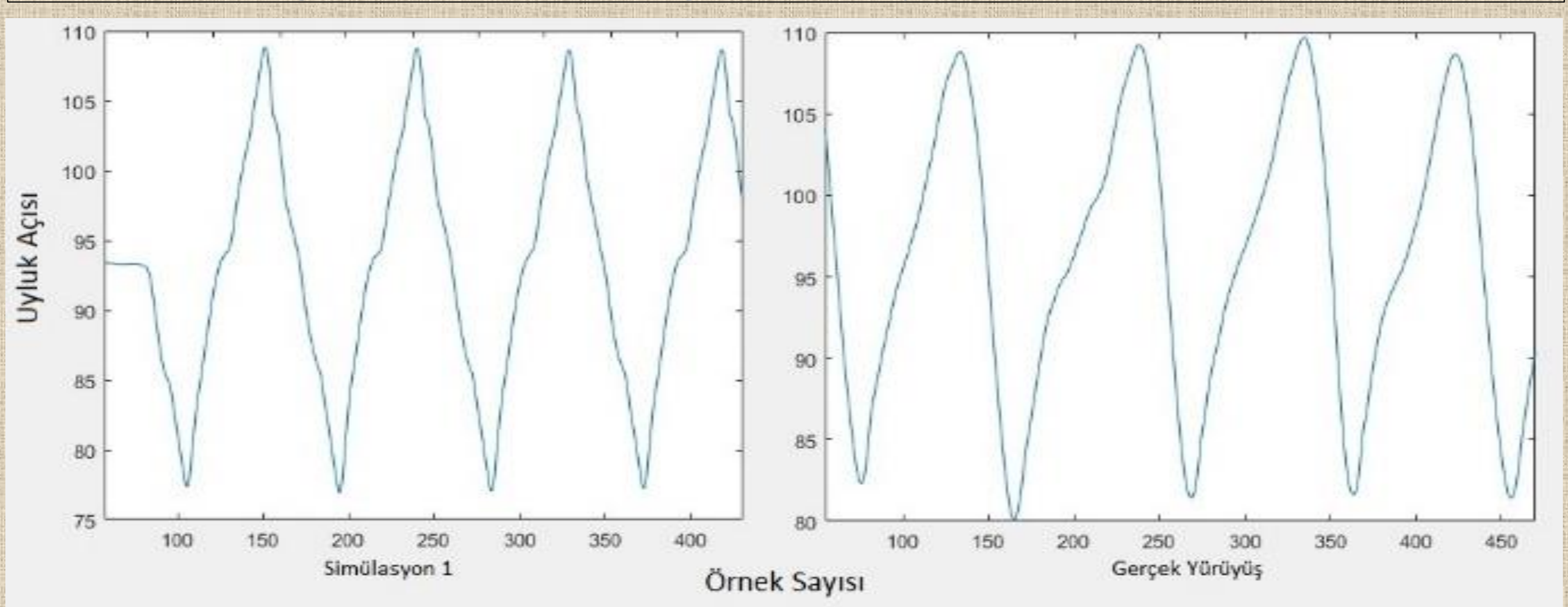

Figure 6: Result of Thigh Angle vs Sample for Simulation and Real Walking

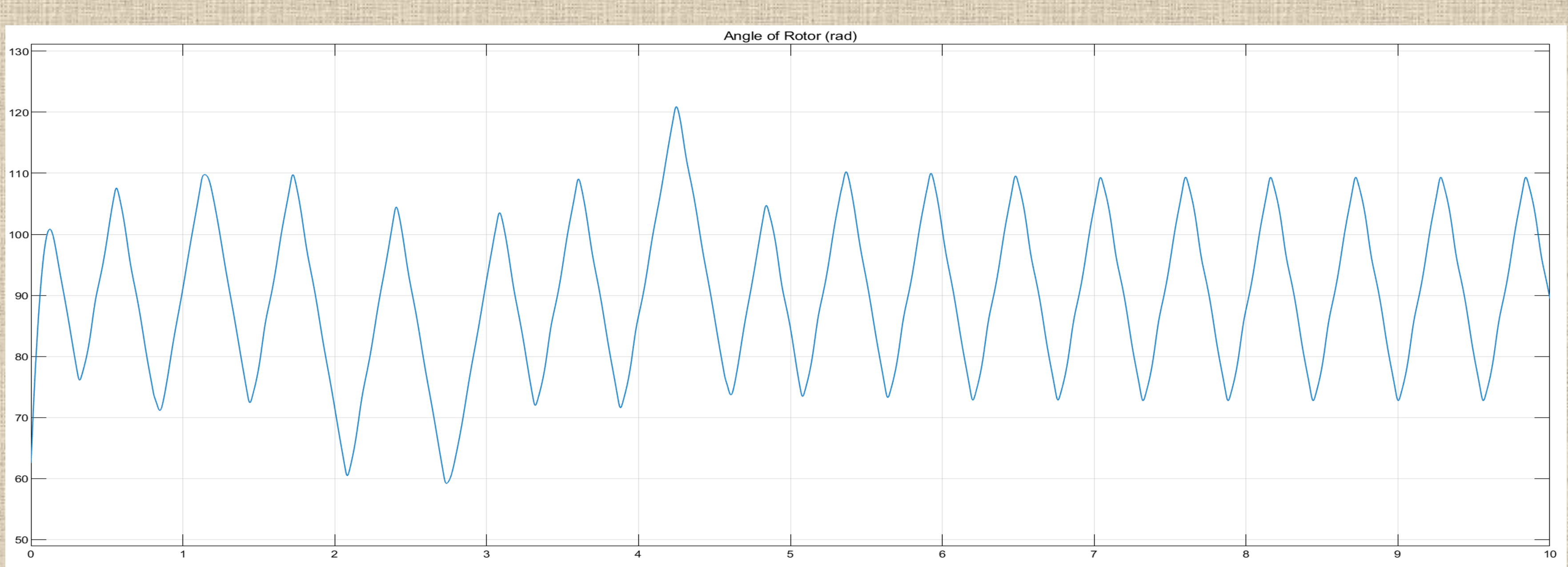

Figure 7: Result of Thigh Angle vs Time for Modelling

What was the problem?

The biggest problem of the system was that it was not complicated and there was no simulation platforms that clearly shows systems existing parts and their connections.

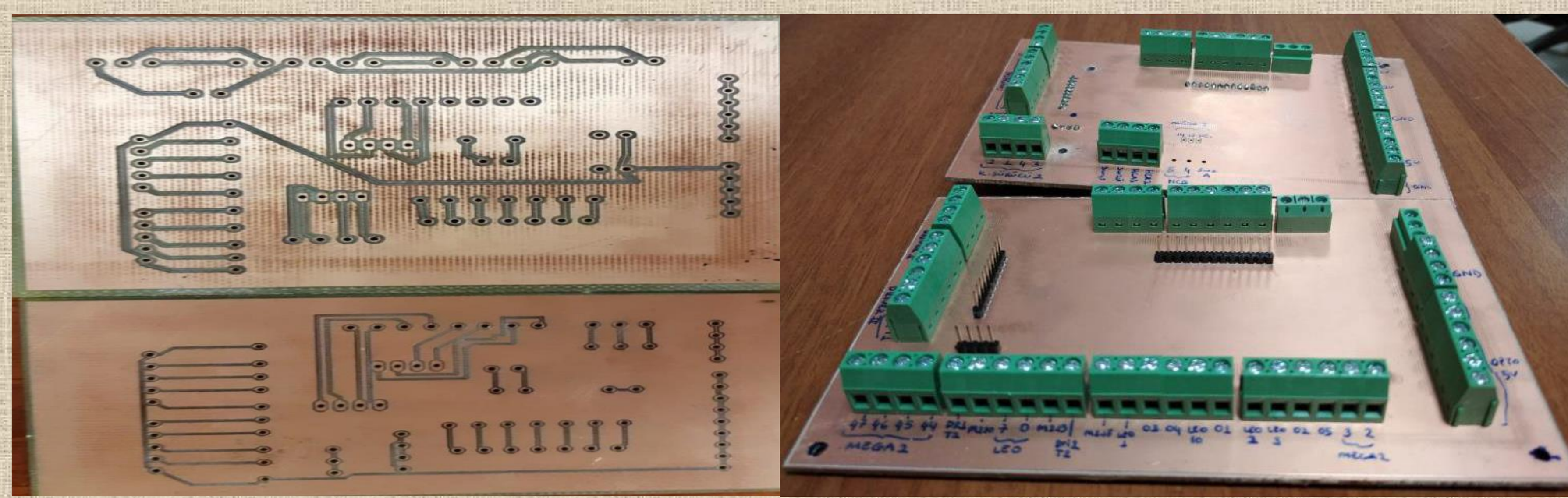

Figure 3: Organizer PCB Design

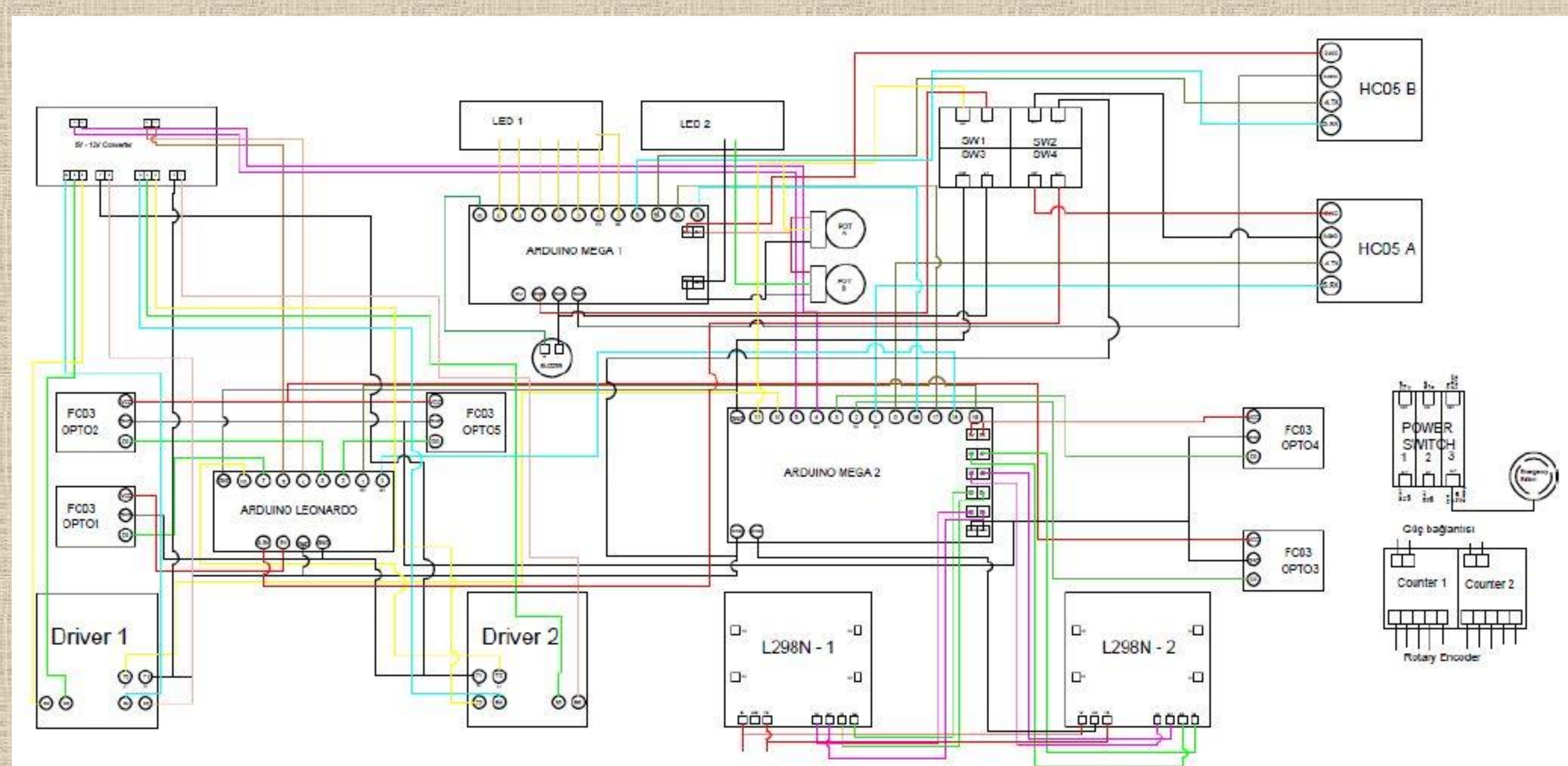

Figure 4: Layout of the System

Modelling of System

The system is primarily divided into the smallest piece that can be modeled. Later, these system parts were modeled separately. After all the system parts have been modeled, the parts can be tested and combined, and the system modeling shown in Figure 5 has emerged. This system modeling can apply the desired simulations as in the existing system, take and analyze the desired angles and give it to the user in the form of the desired graphic as can be seen in Figure 7. You can also see the simulation results and real walking pattern in Figure 6.

References

- Gait Motion Simulator for Kinematic Tests of Above Knee Prosthesis, Prof. Dr. Atila YILMAZ, Tuna ORHANLI
- Electric Machinery Fundamentals, 4th Edition, Stephen J. CHAPMAN