# SUMMARY

This thesis aimed to refine an existing robot system by accommodating diverse motor types, ensuring precise control of each axis, and creating a user-friendly interface for visualizing and manipulating kinematic graphs. The literature review served as a source of inspiration, offering valuable insights into the effective implementation of constant acceleration and deceleration movement, along with real-time plotting of these dynamic motions. The research emphasized students' ability to decide the desired velocity, acceleration, and deceleration times for both DC and stepper motors, enabling the simulation of complex movements.

The limitations of the existing cartesian stand were thoroughly examined, and appropriate hardware components were carefully selected to fulfill the research objectives. The final solution involved utilizing two out of three motors to accurately plot the movement of an end effector. However, the hardware implementation encountered challenges due to incorrectly ordered motor drivers. This issue was resolved by upgrading the chip for stepper and utilizing an available shield for DC motor.

The software implementation proved to be a challenging task, particularly in achieving precise control of the DC motor, which required the implementation and fine-tuning of a PID algorithm. Additionally, formulas for calculating the real and ideal speeds of the motors were developed. The overall outcome of the software implementation was highly satisfactory, with smooth and precise motor movement observed. In comparison, the implementation of the stepper motor proved to be relatively easier.

The results demonstrated the effectiveness of the modified robot stand in responding to parameter changes, accurately translating them into corresponding movements. The success of the implemented solution validates its potential as a valuable tool for kinematics education.

Future considerations should include utilizing a more powerful microcontroller, such as the Arduino Mega, to enhance computational capabilities. Furthermore, replacing the upgraded L293D chip with dedicated stepper drivers would optimize the performance and control of the motors. Improvements in the user interface should also be explored, with a focus on developing a more appealing graphical user interface (GUI) that eliminates the need for manual code changes.

In conclusion, this thesis successfully achieved its research objectives by refining the robot system and developing a user-friendly interface for interactive kinematic graph plotting. The positive results obtained demonstrate the potential for further advancements in hardware, software, and user interface design to create a highly effective and engaging educational tool for kinematics studies.