Cubetto Robot
(Algorithm Design Teaching Robot Toy)

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Context & Objectives

❖ Cubetto robot teaches problem solving skills to early age children and allows them to learn by tapping in a concrete way instead of the screen based on Montessori education (you cannot put in your mind what you cannot put into your hands).
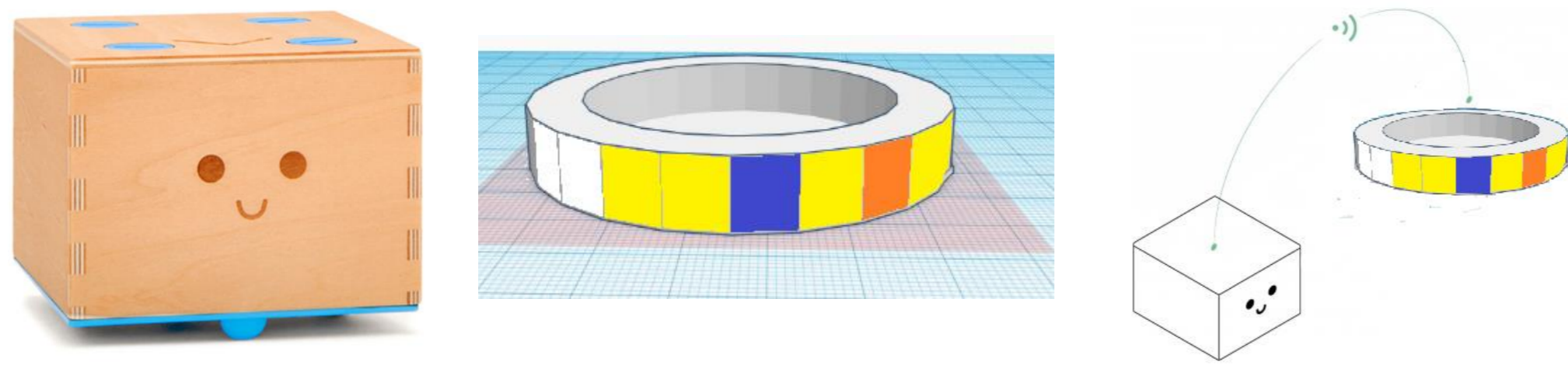

Project Equipment

❖ Arduino (x2) micro-controller for control panel and Cubetto robot.
❖ NRF24L01 Wireless RF Module for telecommunication.
❖ TCS 3200 Colour Sensor (x1) for colour detection.
❖ Interface Board (x1) used as control panel.
❖ DC Motor (x2) for Cubetto movement.
❖ Wheels (x2) for Cubetto movement.
❖ Batteries (x5) for power supply.
❖ Cubetto robot box (x1).
❖ Color Cards (x16).
❖ Map (1m x 1m).
❖ LEDs (x20).

Note-1: *These equipment are chosen very carefully to fit the project needs after consideration of other possible options in the market.*
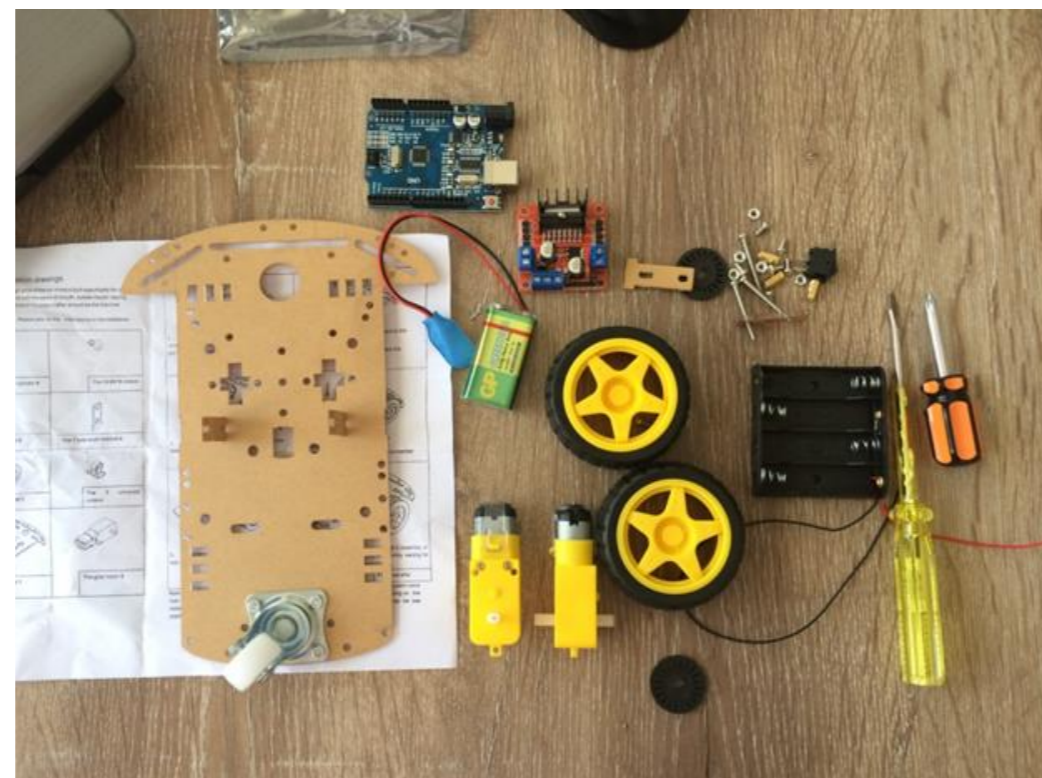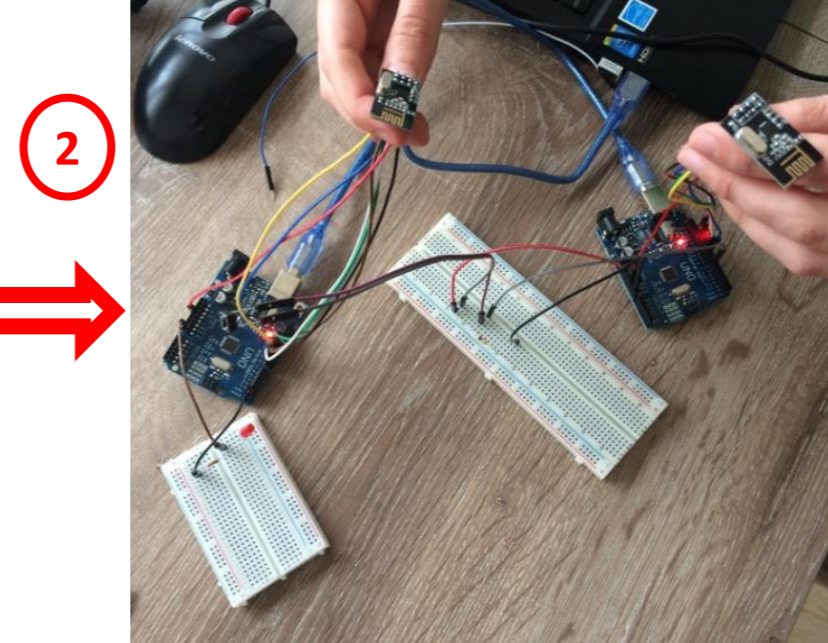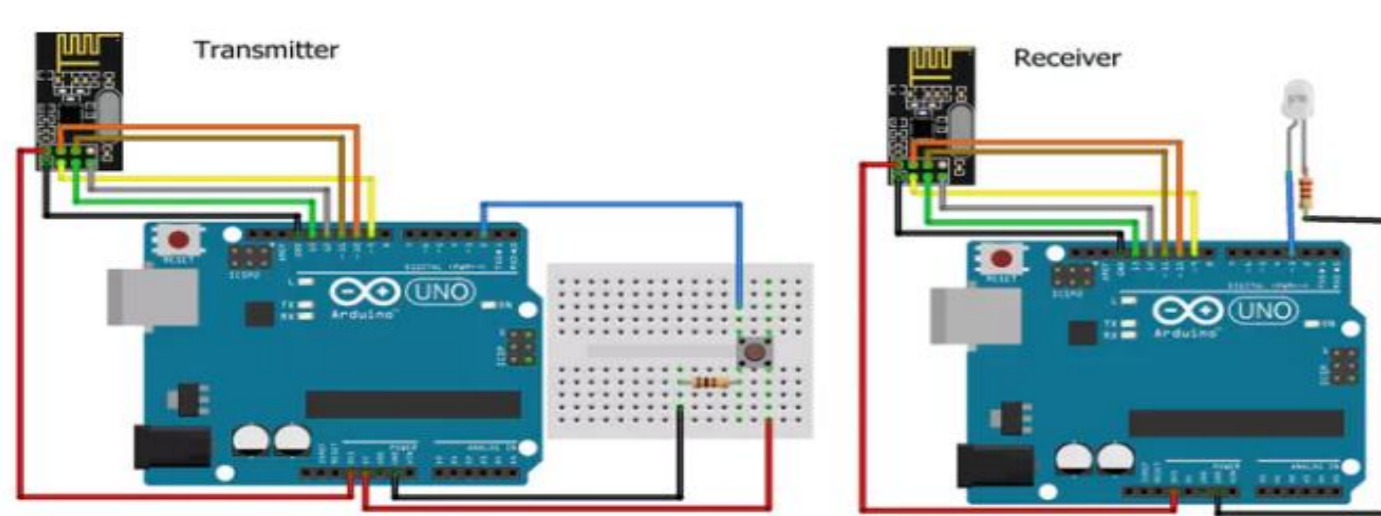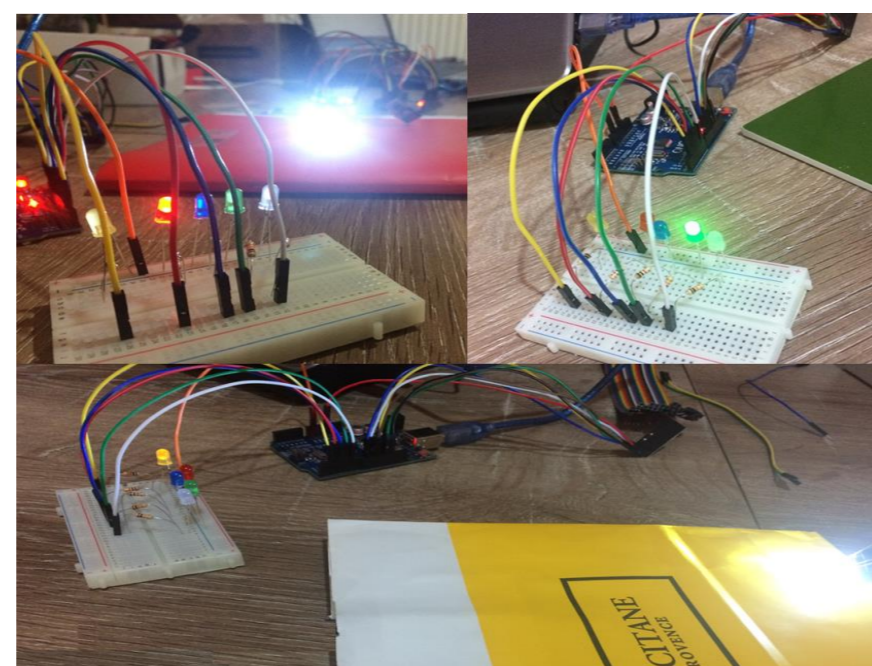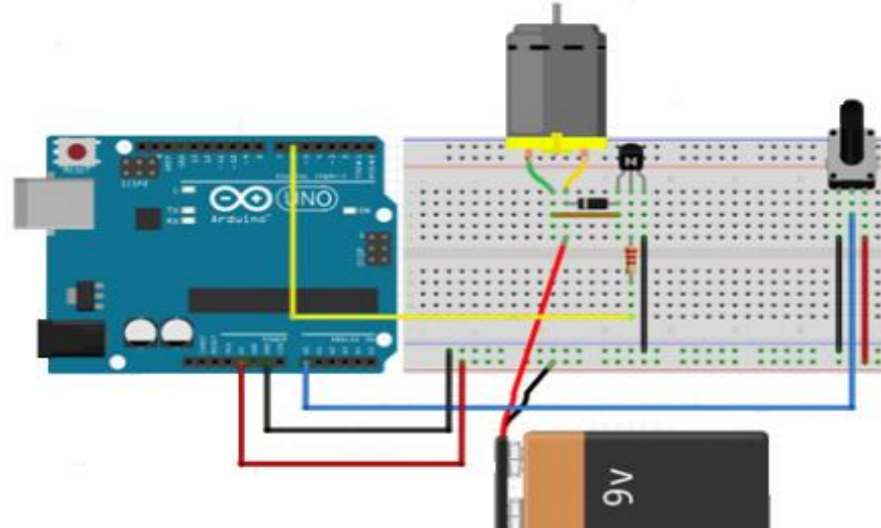

Design Methodology

Hardware Design
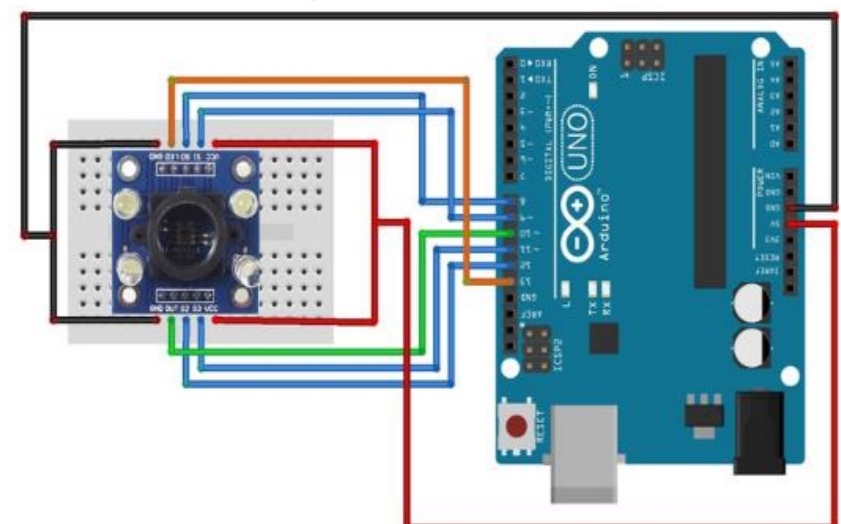
Color Sensors & Arduino Connection:
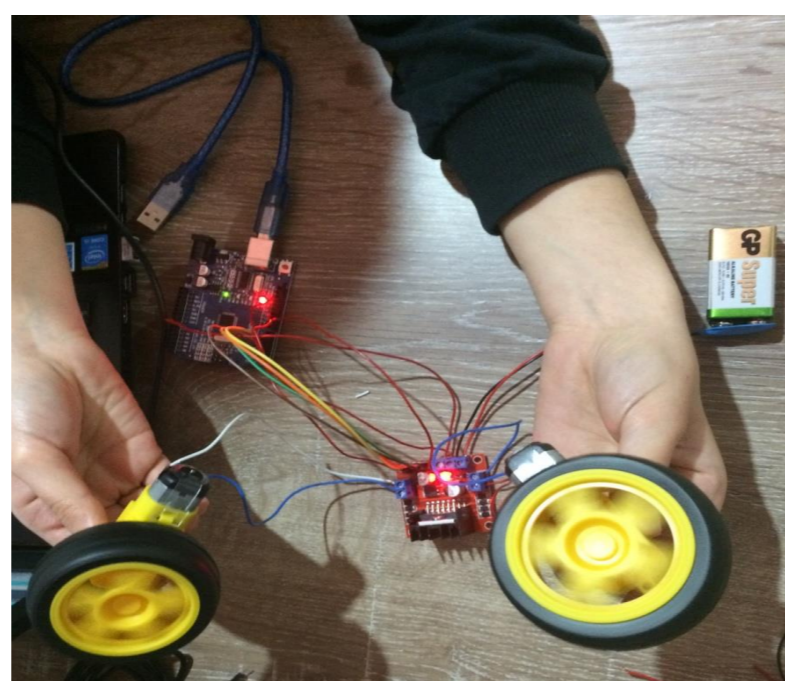Color Detection

NRF Module & Arduino Connection:
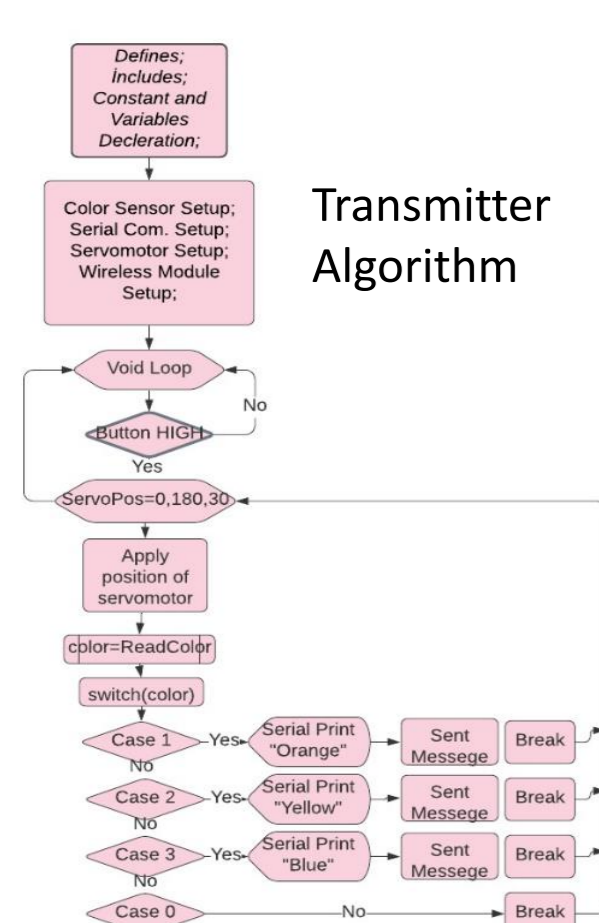Communication between transmitter & receiver

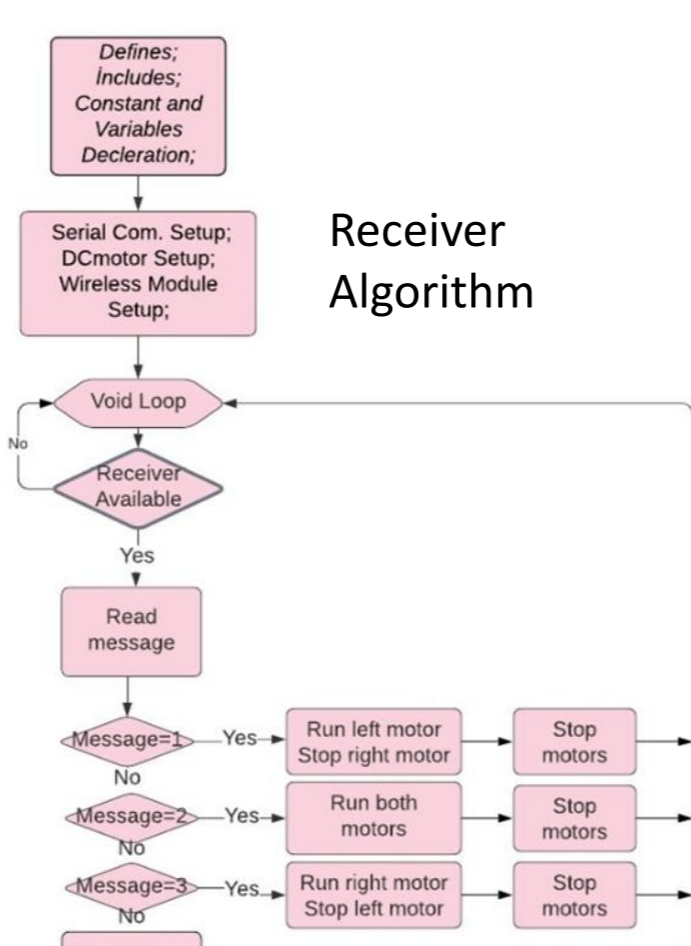DC motors & Arduino Connection:
Cubetto movement

### Software Design

Transmitter Algorithm

Receiver Algorithm

Specifications & Design Requirements

❖ *Cubetto Robot is an entertaining way for children to grow up as producing rather than just using technology, to meet the increasingly important concept of S.T.E.M (Science Technology Engineering Mathematics).*
❖ *All the engineering standards for electronic devices (EIC 61508) and protocols for toys (ISO 8124-1:2018) in reference [2] are considered to provide safety and security to the project especially considering the mass consumers are early age children.*
❖ *Sustainable development goals (SDGs) presented in ref. [3] are also considered in this project to reduce inequality, provide economic growth and educate children.*

Results and Discussion

❖ Prototype design is constructed to test all the design steps based on preliminary design methodology by considering all the engineering standards. The hardware and software parts are tested successfully.
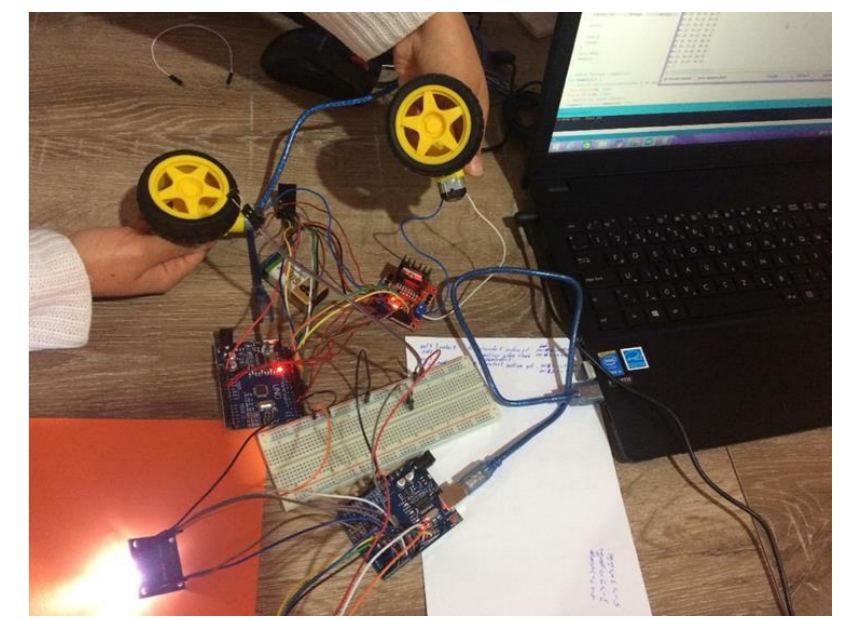
❖ Final design is successfully constructed after ensuring all the parts of the project working properly.
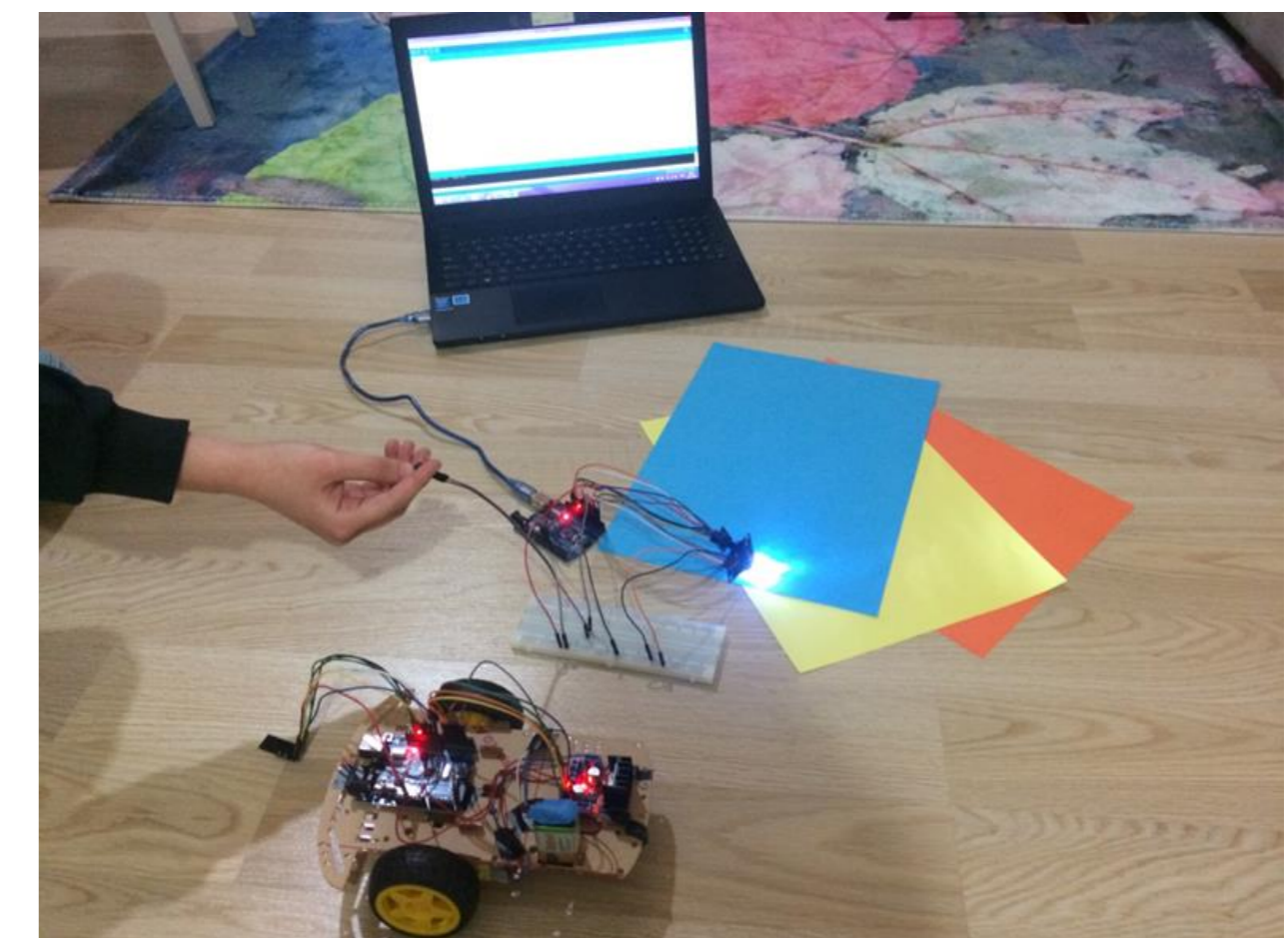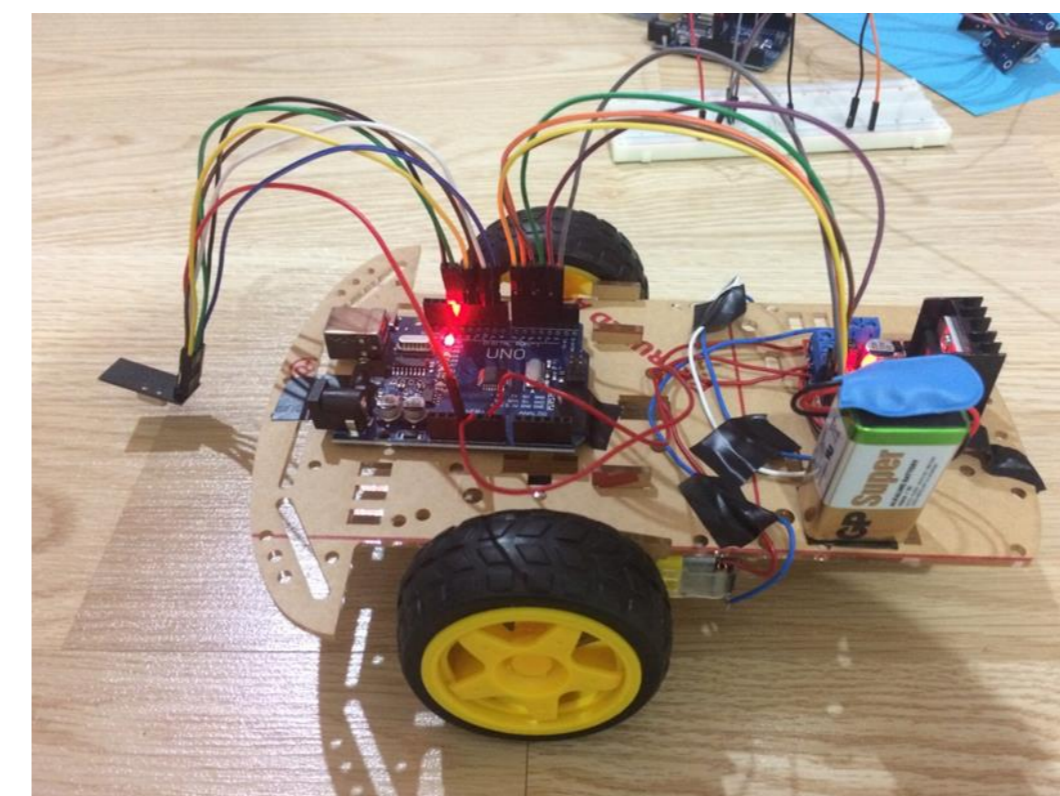
❖ Addition of colour chamber and other little modifications were avoided the massive financial difference which could have been occurred during the project and created an effective design.

❖ The initial goal of the Cubetto robot project successfully achieved by providing to children the logic of learning by practice, by teaching the concepts of distance, position and operation through games, reaching solutions in different ways and creative thinking.

Acknowledgements

❖ This project was completed within the context of ELE401-402 Graduation Project courses in Hacettepe University, Faculty of Engineering, Department of Electrical and Electronics Engineering.
❖ I gradually thank my supervisor Ass. Prof. Baris YUKSEKKAYA for his understanding and tremendous help during the realization of this project.

References

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