Development of remotely controlled RC tank platform

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Introduction

This project consists of a remote-controlled tank platform and an interface running on the user computer. The purpose of the project can be explained as follows. Computer games cannot meet the reality demand of the players. The proposed solution to overcome this problem involves the creation of physical IoT robot platforms that can be deployed in real outdoor environments. These platforms aim to satisfy players' desire for a more immersive and realistic gaming experience.

Specifications and Design Requirements

❖ Remote-controlled tank platform can move forward, backward, right, and left.
❖ It can move at a speed of 0.6 km/h and can climb a slope of 26 degrees.
❖ It provides the user with a 480p 60fps video stream through its onboard camera.
❖ The system conveys information such as current time, ambient temperature and humidity, CPU and MPU temperatures, battery voltage, and estimated battery capacity to the interface.
❖ The live video and all data are tracked in real-time through an interface that operates within a web browser.
❖ The user controls the RC platform's movements through keyboard inputs on the User Interface.

Solution Methodology
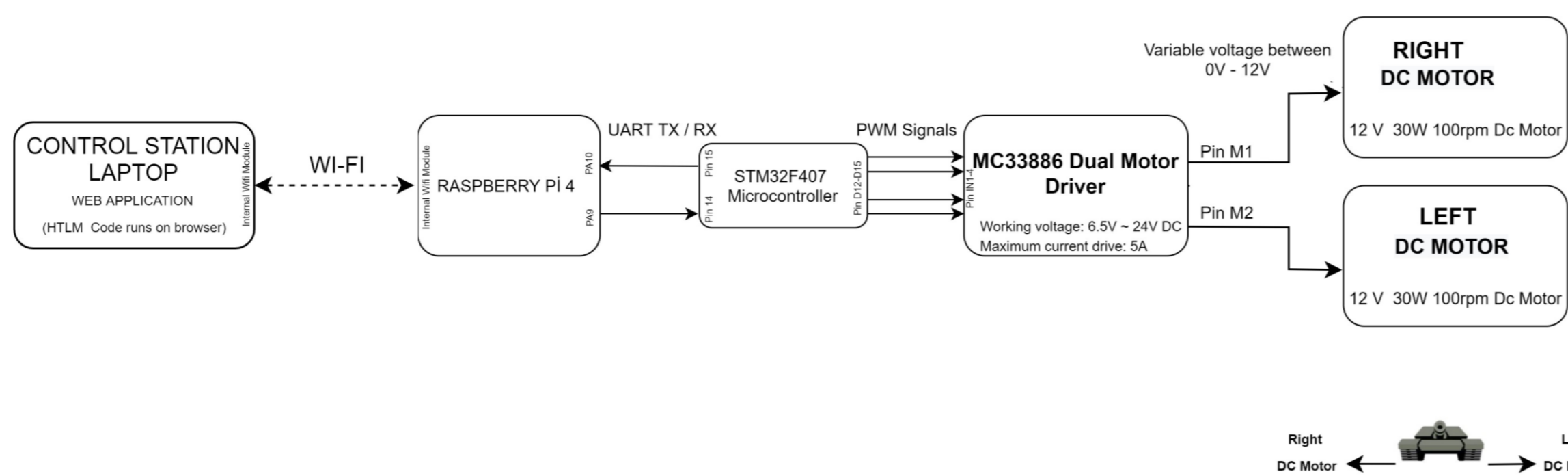
❖ Raspberry Pi 4 has been employed for communication and video streaming on the platform.
❖ The STM32F4 microcontroller controls the mechanical subsystem's movements, while it communicates with the Raspberry Pi via UART.
❖ The system is powered by a 4S 7000mAh LiPo battery.
❖ The MC33886 dual motor driver controls two motors.
❖ It operates using two DC motors with a power of 30W each, powered by 12 volts.
❖ The imagery captured by the Raspberry Pi Camera Module 3 is transmitted to the interface.
❖ The communication between the platform and the User Interface occurs through Wi-Fi using a peer-to-peer connection.

RC Tank Platform and UI
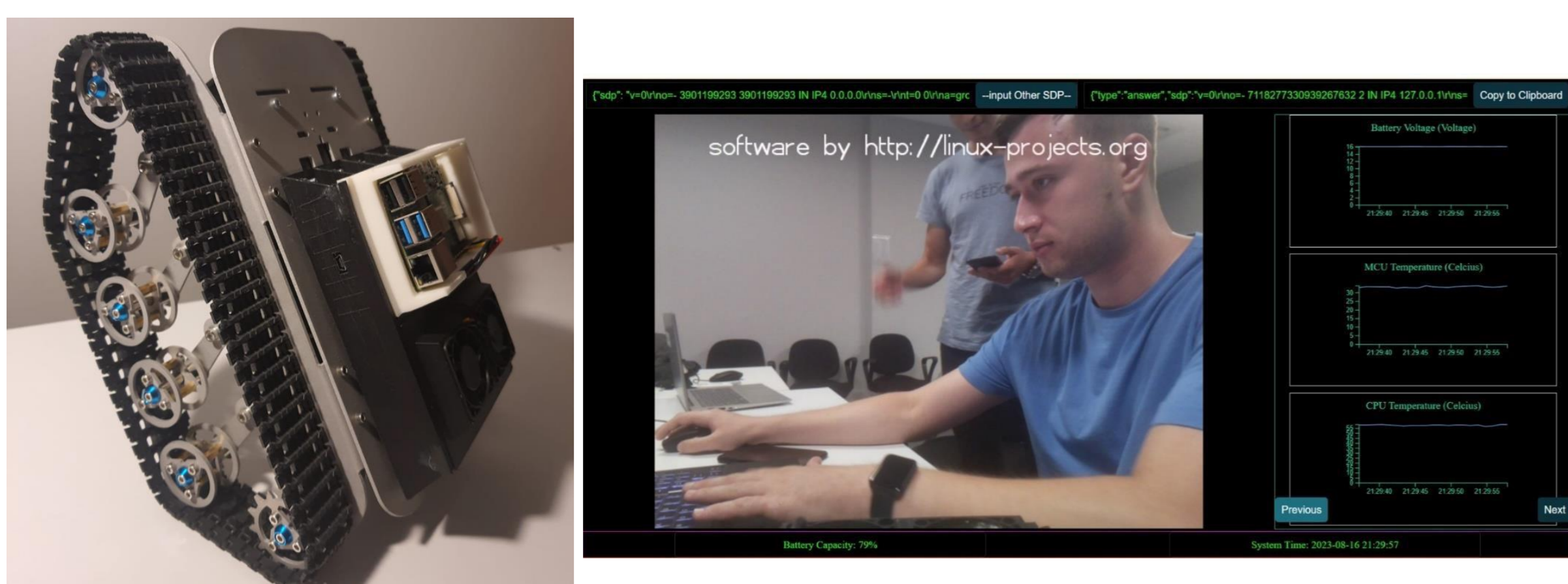
Application Areas

❖ The IoT tank platform, thanks to its fundamental design, can be utilized across various fields. Despite being designed for gaming purposes, it holds potential for applications such as exploration, observation, and transportation. It can offer benefits in diverse sectors, including military, construction, mining, forestry, and environmental management. These types of platforms, due to their functionality and flexibility, can serve as versatile vehicles in a wide range of industries.

Comparison with Similar Project
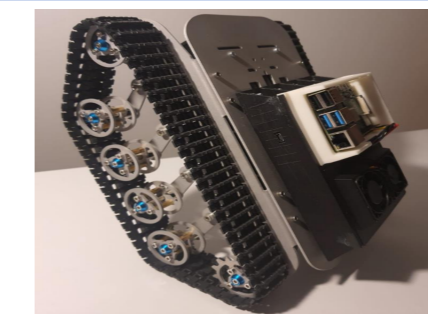
OUR PROJECT	GÖKAL P-01 Tank Robot
Ready-made mini-tank chassis	Handmade mini tank chassis
2 x 12V DC motors	2 x 12V DC motors
STM32 Microcontroller + Raspberry Pi 4	Atmega328 Microcontroller
Fixed Camera	Action Camera
For Gaming	Military Purpose
X	Shoots with laser module
System health and battery data	X
Web User Interface	Android User App

❖ This robot platform we have built has a web browser user interface that makes it easy to install on the internet and to reach more users without any compatibility problems. In addition, the use of raspberry pi and STM32 microcontroller together increases the computational efficiency of our system and creates more space for development.

Results and Discussion

❖ The project aimed to address the demand for realism by enabling computer games to be played on IoT platforms. To achieve this goal, the RC tank platform was designed and produced in a way that allows the user to conduct exploration missions.
❖ This process began with subsystem designs, and the prototype was created by integrating the tested subsystems. This prototype evolved into the final product through testing and iterations.
❖ The product is designed to be open to further development. With the addition of additional equipment, it can be adapted to various game scenarios such as tank war games, construction simulation games.

References

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Acknowledgements