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Arduino BT-RC Military Truck

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***Abstract*—In this paper, a Bluetooth-controlled RC military truck using Arduino and HC-05 has been designed and developed. It has a spring-suspended dual pipe cannon attached to it that is capable of being laser targeted and also has a firework ignition mechanism powered by a chromium coil and last but not least, the truck has the capability to move in all directions. All the components are integrated to provide realistic movement, shock absorption and better off-road performance. A low-cost prototype weaponized robot unit using recycled materials is demonstrated by the system.**

Keywords—Arduino UNO, HC-05 Bluetooth Module, RC Military Truck, Firework Ignition System, Dual-Pipe Cannon, Spring Suspension, L293D Motor Driver, Chromium Heating Coil, BC547 Transistor, IoT Robotics, Weaponized Robot Prototype

I. INTRODUCTION

In the modern military and robotic systems are tending toward automation and remote operability in order to reduce human risk and increase efficiency [1]. A prototype model of a Bluetooth-controlled military truck replicating the functionalities of a weaponized robot, which uses Arduino UNO and HC05 Bluetooth Module, is presented in this paper. Features such as multi-directional motion, a spring-based dual pipe cannon with a firework ignition system, laser targeting and a shock absorbing suspension system are integrated into the vehicle [2].

This project was developed with cost-effective, easily available materials such as plywood, cardboard and recycled components [3], to so as to demonstrate a practical implementation of core electronics and mechanical concepts. The truck demonstrates creative design thinking and the use of IoT in defense systems, which are of real-world applicability, inspired by steam engine mechanics and traditional ignition techniques [4][5].

This introductory section discusses the core idea of the project, to design an affordable, creative and educational-looking remote-controlled military truck prototype with functional and real like capabilities to simulate basic defense operations.

II. SYSTEM DESIGN AND WORKING

This is a Arduino BT-RC Military Truck is a custom-built prototype of a military truck simulating weaponized robotic functions. Motion control, cannon mechanics, laser targeting, firework ignition and suspension are the various modules of the system [6]. The IoT based mobile application wirelessly controls it using an HC-05 Bluetooth module [7][8].

The vehicle mobility is based on six DC 100 RPM motors giving about 1.5 kg/cm torque each. The motors sit on a lightly tempered 1 mm thick L shaped iron sheet mounted in a 3:2 configuration. A suspension mechanism consisting of 1.5 mm and 1 mm toy springs allows for independent movement and shock absorption, enhancing off-road performance. The suspension system supports up to −30° tilt using 1.5-inch and 2-inch screws as smooth guiding shafts.

For directional control, motors are grouped in pairs and connected in parallel using 1 mm copper winding wires. Two L293N motor drivers control left and right movement via Arduino PWM pins 5, 6, 10, and 11, offering efficient torque management and speed control [9].

A dual-pipe cannon is mounted on the chassis, consisting of an inner movable pipe housed inside a fixed outer pipe [10]. The up-down motion of the cannon is inspired by James Watt's steam engine mechanism, using a 3 RPM motor with a rotating wheel and linkage arm. A 5-watt laser is installed atop the cannon and switched via a BC547 transistor, which Arduino controls to simulate laser aiming.

The ignition system uses a 4 cm chromium wire with a resistance of 6.5 ohms, powered by a 12V battery through a relay [11]. The coil is mounted outside the cannon's firework chamber, igniting the exposed fuse. To enhance the boom and air pressure, a small disc made from cartoon paper is placed in the cannon's mouth, amplifying the blast effect. The firing chamber uses welded carbonated cast iron and steel water pipe connectors [12].

Three relays are employed: one for firing coil control, one for headlights and backlights, and one for a battery indicator circuit made using LEDs, zener diodes, and resistors. BC547 transistors also control right and left indicators, along with the laser trigger.

Voltage regulation is handled by 7812 and 7805 regulators for smooth 12V and 5V module operation. Power is supplied by two 6V, 5Ah batteries connected in series to form a 12V pack [13], with a toggle switch to alternate between charging and operational modes. The cannon's dedicated motor driver circuit is built separately on a zero PCB.

The body structure is made from plywood and cardboard, finished with putty, wood primer, and oil paint. Decorative components like mirrors and lights are made from transparent PVC with marker coloring, secured using hot glue. The final prototype reflects a realistic military vehicle aesthetic while maintaining cost-effectiveness and functionality.

The following block diagram (Figure 1) illustrates the complete connection flow of the system.

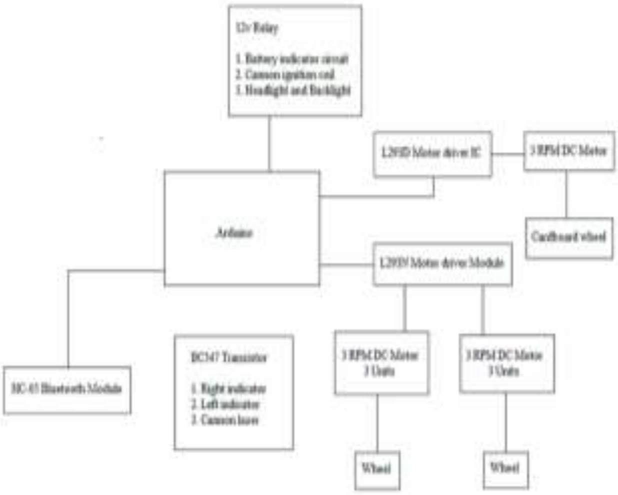

Fig. 1. System block diagram of Arduino BT-RC Military Truck.

III. Results and Observations

The Arduino BT-RC Military Truck prototype was successfully built and tested under controlled indoor and semi-outdoor environments. The vehicle demonstrated smooth movement in all four directions with effective radial and axial turning using Bluetooth control. The suspension system allowed individual motor flexibility, providing smooth navigation over uneven surfaces, thereby validating its off-road capability [14].

The dual-pipe cannon system effectively replicated real-world motion. The up-down mechanism inspired by a steam engine successfully achieved angular elevation, while the internal pipe housing the blasting chamber provided directional shooting. The firework ignition system consistently ignited the fireworks from a safe external coil location, after 13 failed prototypes and refinements. The use of a press-leaf-inspired chromium wire coil proved durable and efficient with a resistance of 6.5 ohms.

The laser aiming module activated successfully on command, offering precise visual targeting. All electronics including the headlights, backlights, battery indicator, and laser were individually tested and verified [15]. The three-relay control setup ensured isolated and smooth switching for all high-power sections.

In terms of aesthetic design, the realistic appearance crafted from cardboard and plywood enhanced the overall visual impression, creating a miniature representation of a weaponized vehicle. The vehicle, while low-cost and assembled using commonly available materials, performed tasks typically associated with high-end robotic systems, especially in the defense domain.

Overall, the truck met its intended objective: to demonstrate a working prototype of a Bluetooth-controlled weaponized robotic vehicle using accessible technologies and minimal resources [16].

IV. Conclusion

The Arduino BT-RC Military Truck project successfully demonstrates the potential of low-cost, Bluetooth-controlled robotics in defense-inspired applications. Despite the constraints of being a student-level prototype, the vehicle integrates multiple complex systems including directional movement, dual-pipe cannon firing, laser targeting, and a suspension-supported chassis into a cohesive and functional model.

The project highlights the creative use of everyday materials, electronic components, and classical mechanical concepts, such as the steam engine-inspired cannon elevation system. The challenges faced during the ignition system development led to an innovative and safe solution, showing how persistence and iteration can yield reliable results even with limited resources.

While the current prototype is operated via an insecure Bluetooth-based IoT app, it lays the groundwork for future enhancements, such as secure wireless control, GPS-based navigation, camera surveillance, and AI-driven decision-making [17][18]. This model thus serves as both a learning tool and a conceptual bridge toward the future of weaponized robotics in defense and security domains.

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