



REMOTE CONTROLLED HOCKEY ROBOT

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Project Description

- A teleoperated video-transmitting hockey robot which is controlled without cable connection or Wi-Fi

Functional Requirements

- Imaging the playfield for both indoor&outdoor usage
- Commanding the robot without naked eye
- Transferring data without cable connection or Wi-Fi
- Constructing movement and kicking mechanisms according to game rules

Method of Solution

- Two pairs of RF antennas
 - 433 MHz for command transmission
 - 5.8 GHz for image transmission

Block Diagrams

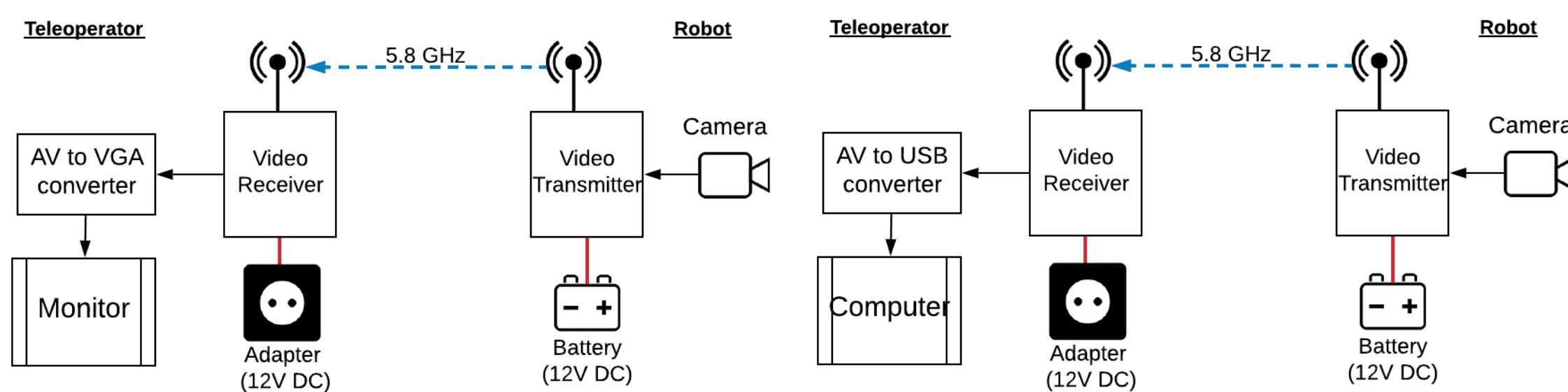


Figure 1. Block Diagrams of Imaging Unit

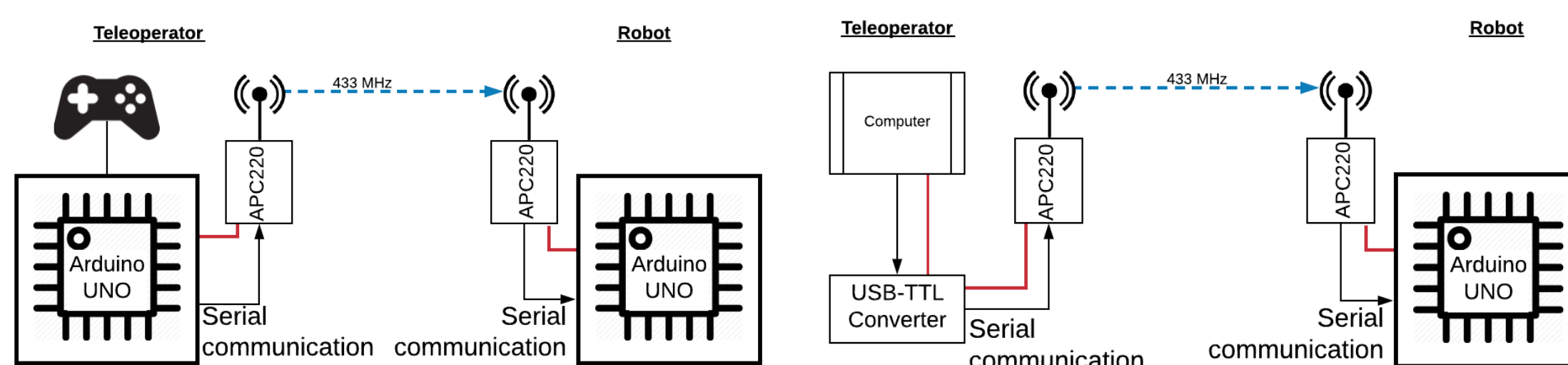


Figure 2. Block Diagrams of Commanding Unit

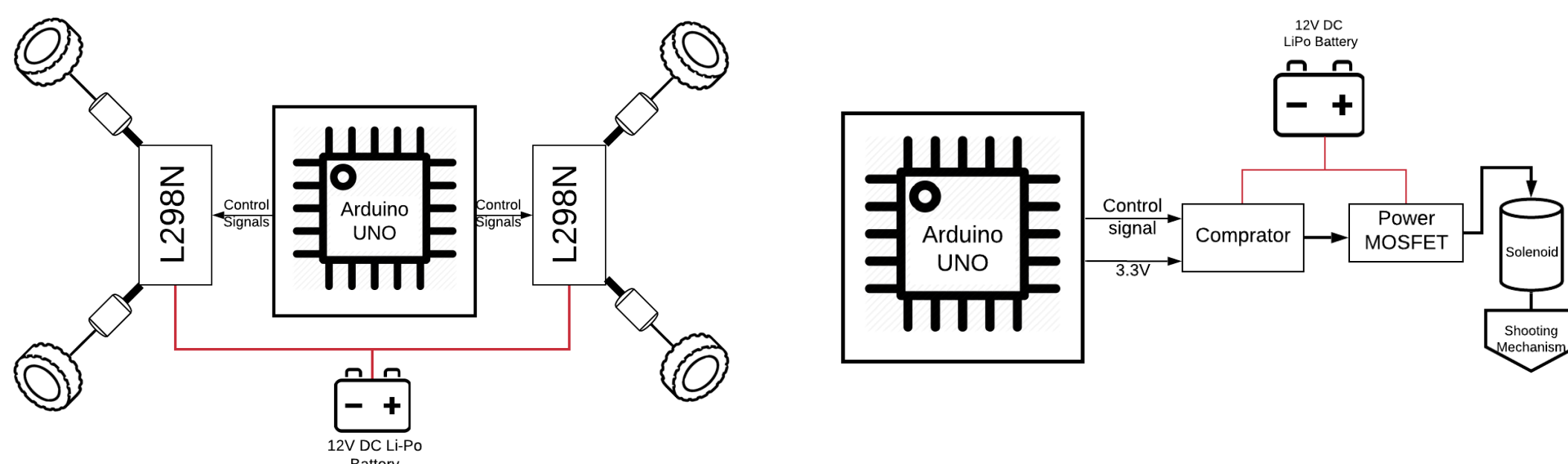


Figure 3. Block Diagrams of Movement and Kicking Unit

Performance Tests&Results

Table 1: Imaging unit test results

Check Point	Distance (m)	Video Signal Status		
		High Quality	Low Quality	No Signal
D Block Stairs	20	X		
VLSI Lab	35	X		
Between E&D Blocks	44		X	
Entrance of E Block	55		X	
2nd Floor of E Block	60			X

Table 2: Commanding unit test results

Check Point	Distance(m)	Signal Status	
		Successful	No Signal
D Block Stairs	20	X	
VLSI Lab	35	X	
Btw E&D Blocks	44		X
Entrance of E Block	55		X

Base station of tests is the bench next to the study hall in D Block.
Average speed of Robot: 34 cm/s
Min. speed of kicked ball: 40 cm/s
Max. speed of kicked ball: 80 cm/s

Power Consumption

- 4 motors – 4 x15 Watts
- Video transmitter – 0.5 Watts
- Arduino – 0.3 Watts
- Solenoid – can be neglected
- 3800 mAh LiPo Battery can last 45 minutes
 - Can be charged in 2 hours

Mechanical Design

- Four symmetrical omni-wheels at the corners
- A concave kicking mechanism

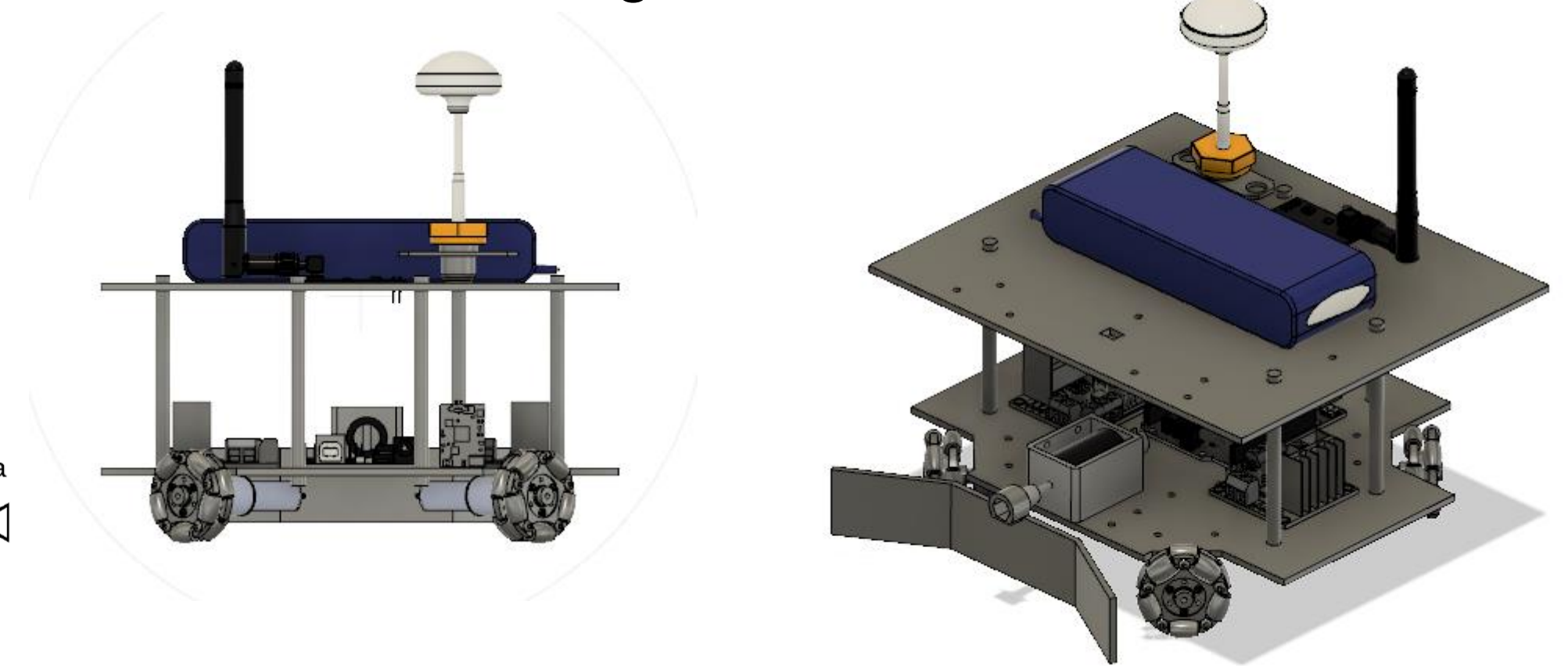


Figure 4. 3D views of the robot

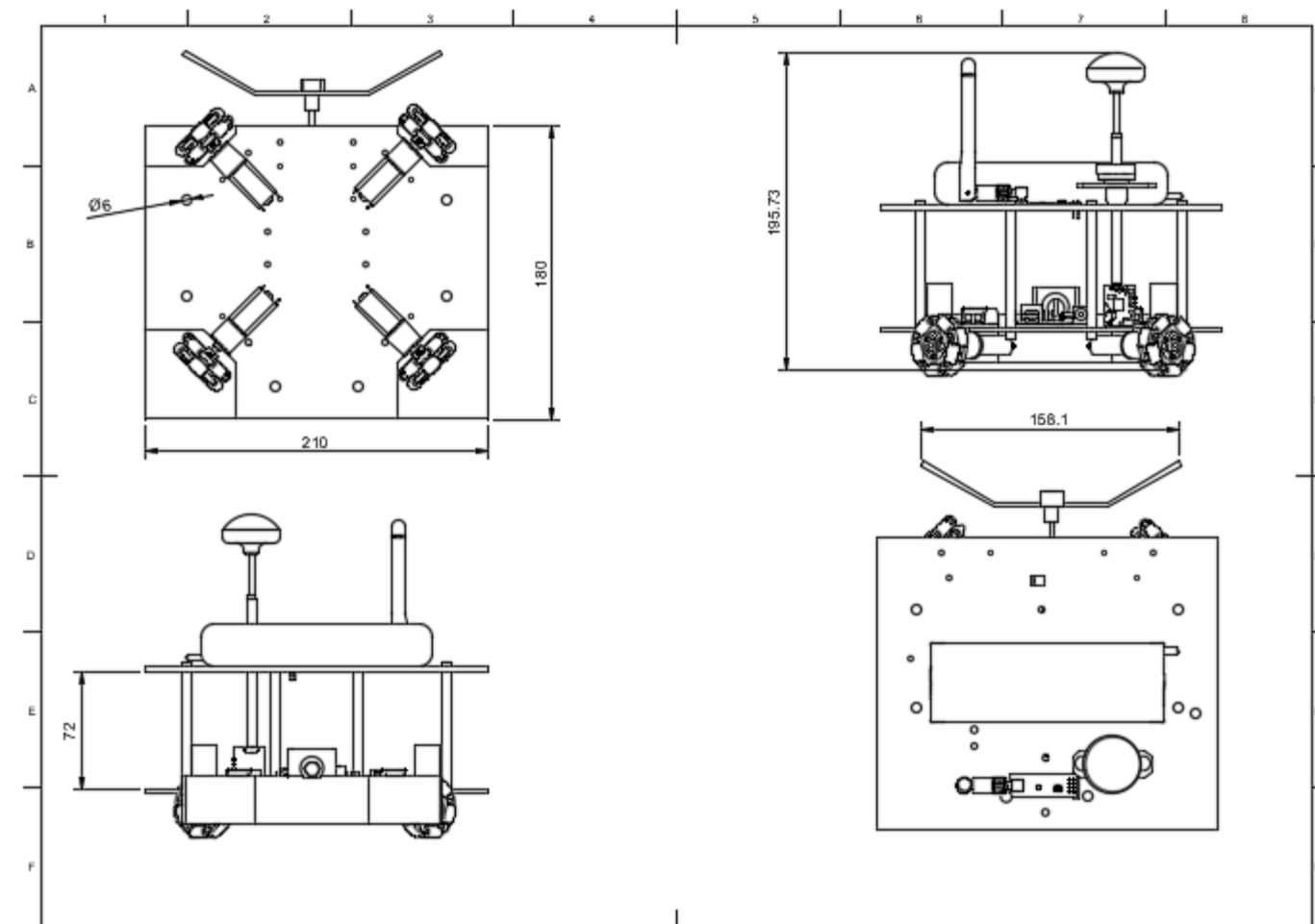


Figure 5. Technical drawings of the robot

Cost Breakdown and Deliverables

Table 3: The Cost Analysis of the Final Product

Product Number	The Product	Item	Cost per item (\$)	Total Cost (\$)
01	Eachine FPV Boscama 5.8g 600mw 32ch	1	23.91	23.91
02	600TVL 1/4 1.8mm CMOS FPV Camera	1	6.96	6.96
03	APC220 Wireless Data Communication Module USB Adapter Kit	1	18.20	18.20
04	Antenna Set	1	24.69	24.69
05	Omni Wheel	4	5	20
06	12V 350 RPM DC Encoder Motor	4	12	48
07	Laser Cut+Plexiglass	1	8	8
08	Arduino Uno R3	1	4.28	4.8
09	L298N motor driver	2	1.22	2.44
10	BQY Power 11.1V 2200mAh Lipo Battery	1	9.82	9.82
11	Solenoid Type Electronic Push	1	13.80	13.80
12	Playfield Walls+Ball	6	1	6
	Total Cost of the Robot			186.62

Table 4: Deliverables

Deliverables	Amount
Robot	1
Playfield Walls	6
Connector	1
Battery	1
User Manual	1
Software	1
Joystick	1