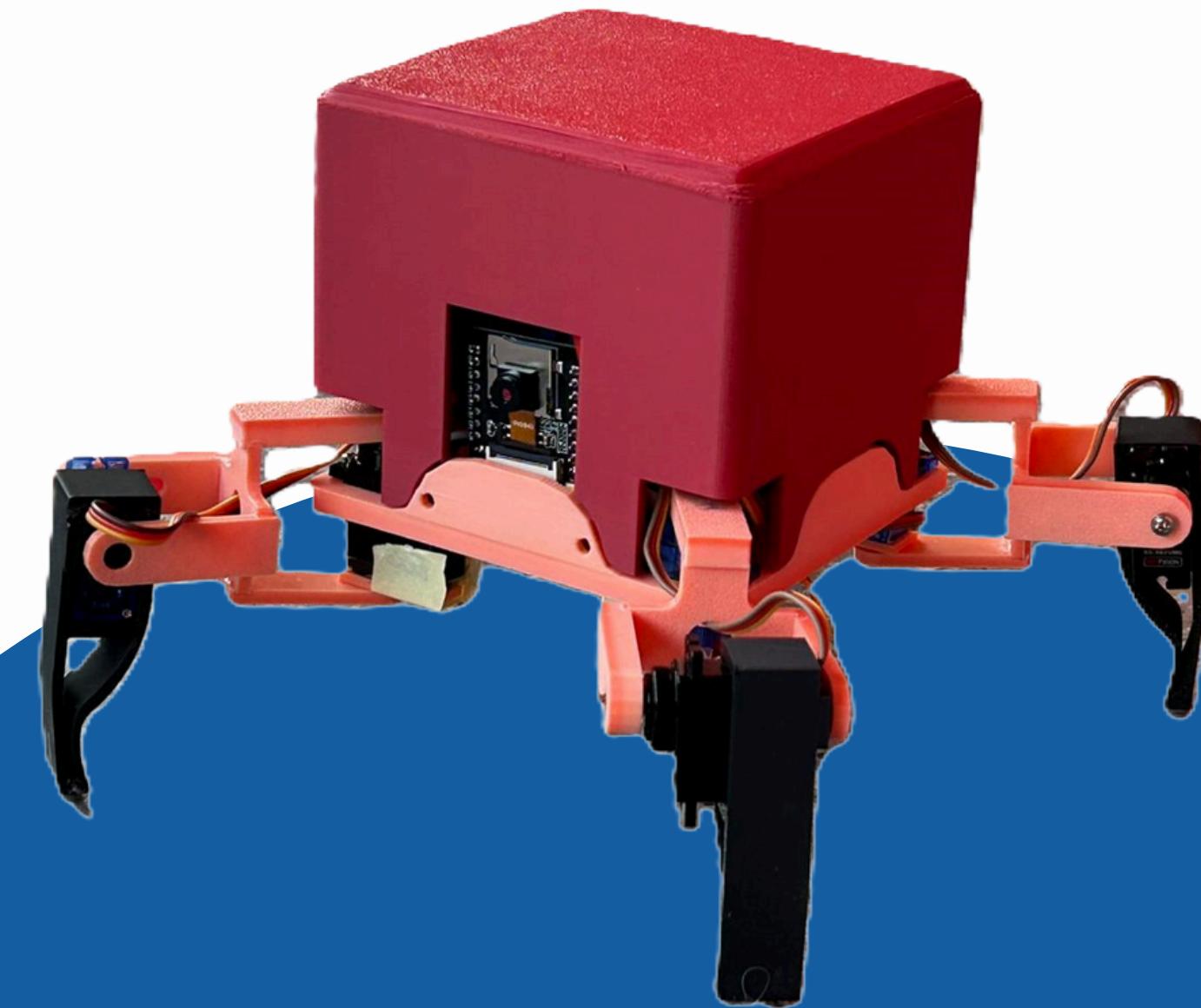


Spider Robot

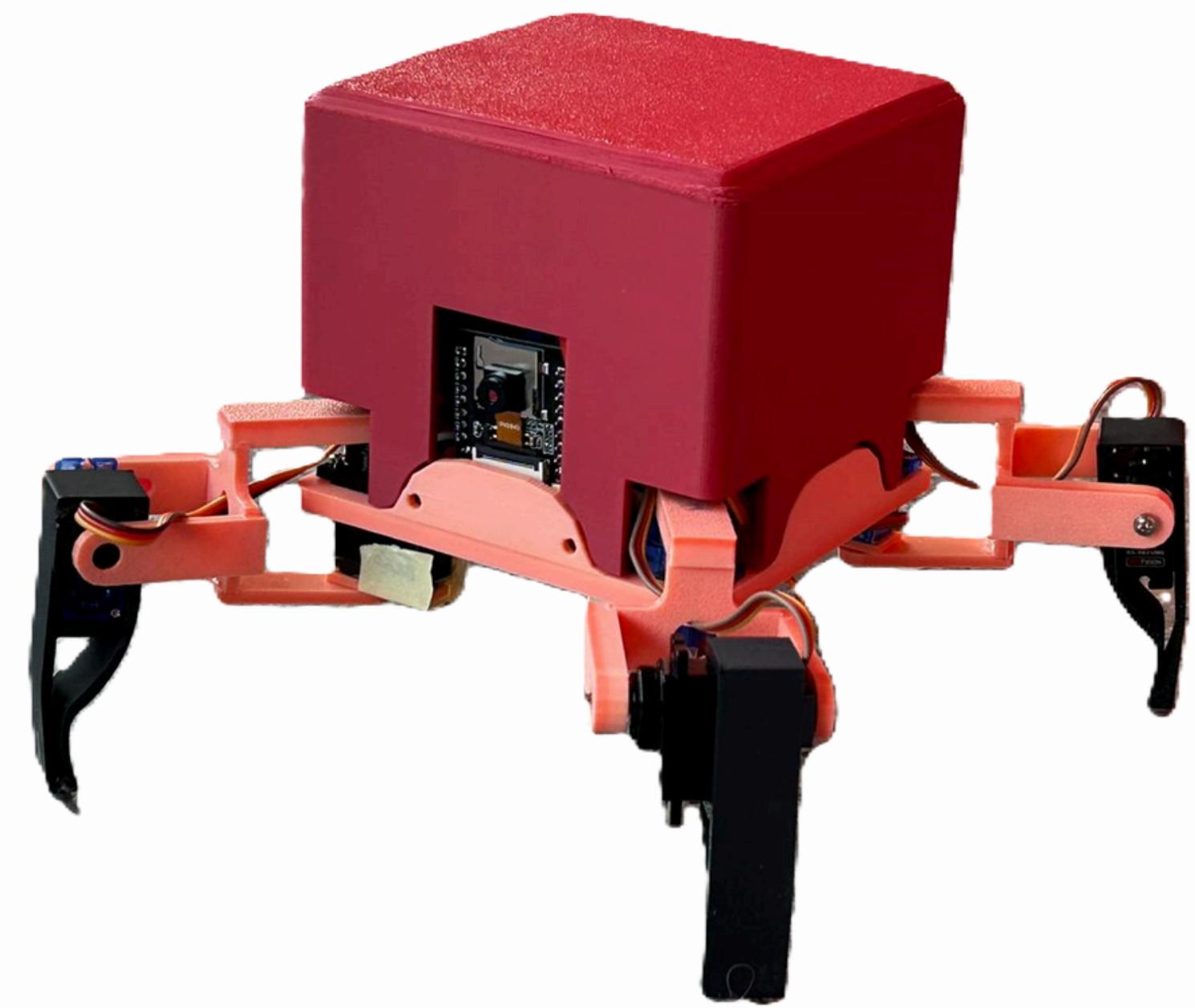
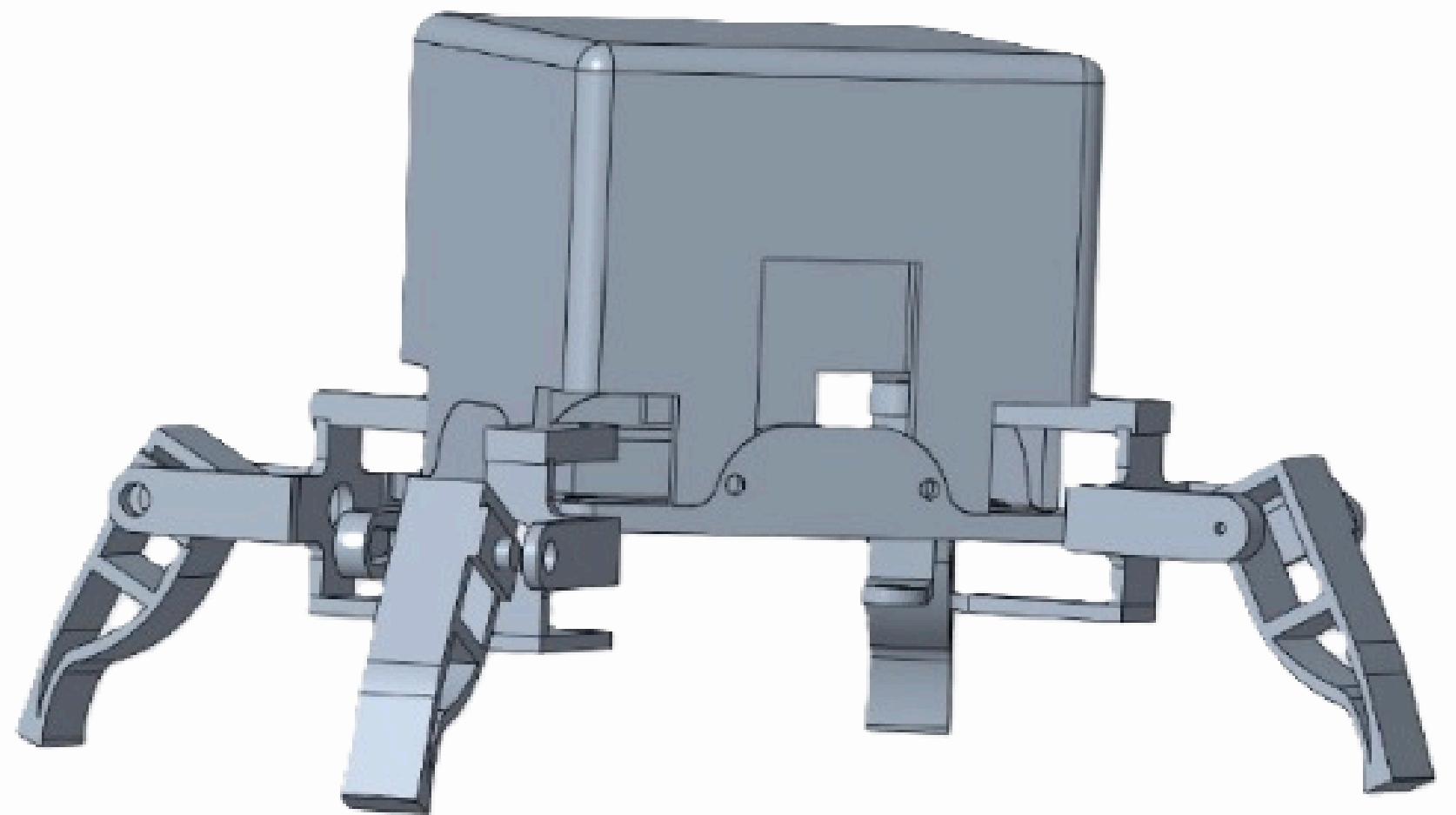
Maria Shreiber, Òscar Guerrero,
Roger Camps & Sergi Piguillem



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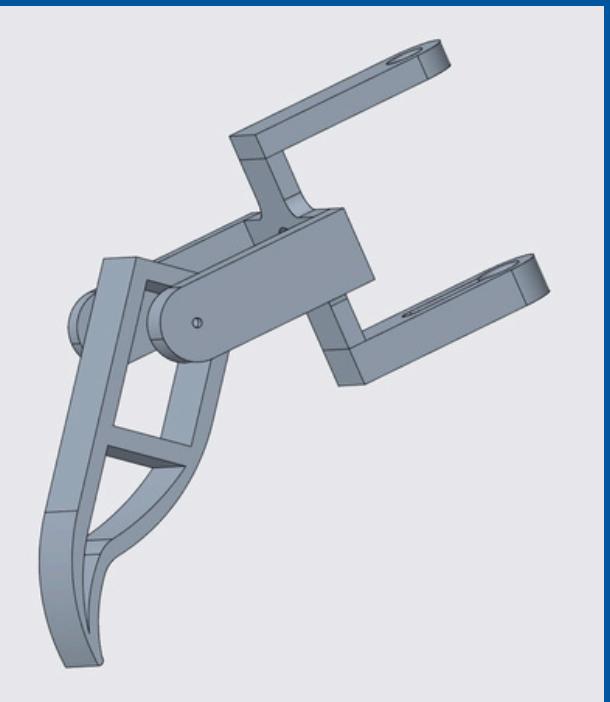


Objectives

Remote controlled Spider-looking robot

01

Four legs



02

Vision mechanism



03

Autonomy of 30 minutes



04

Compact design 20 cm in width and length



Specifications

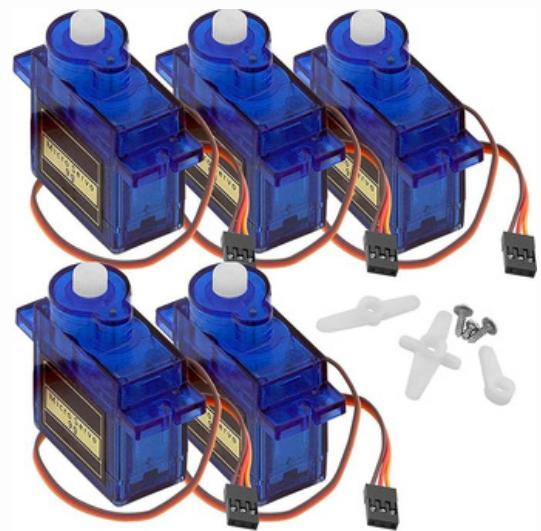


Weight
477,3 g



Dimensions
16,7 x 17,5

Components



Micro
Servomotors



ESP - 32 Cam



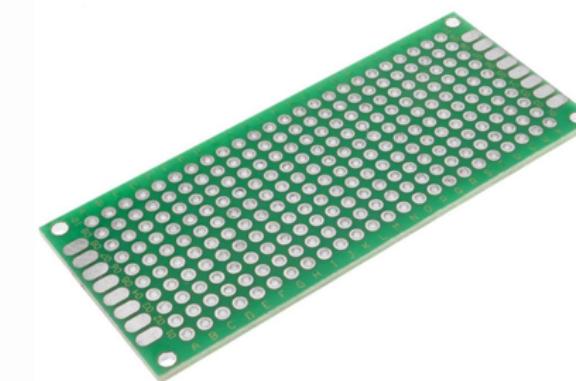
Battery



Regulator

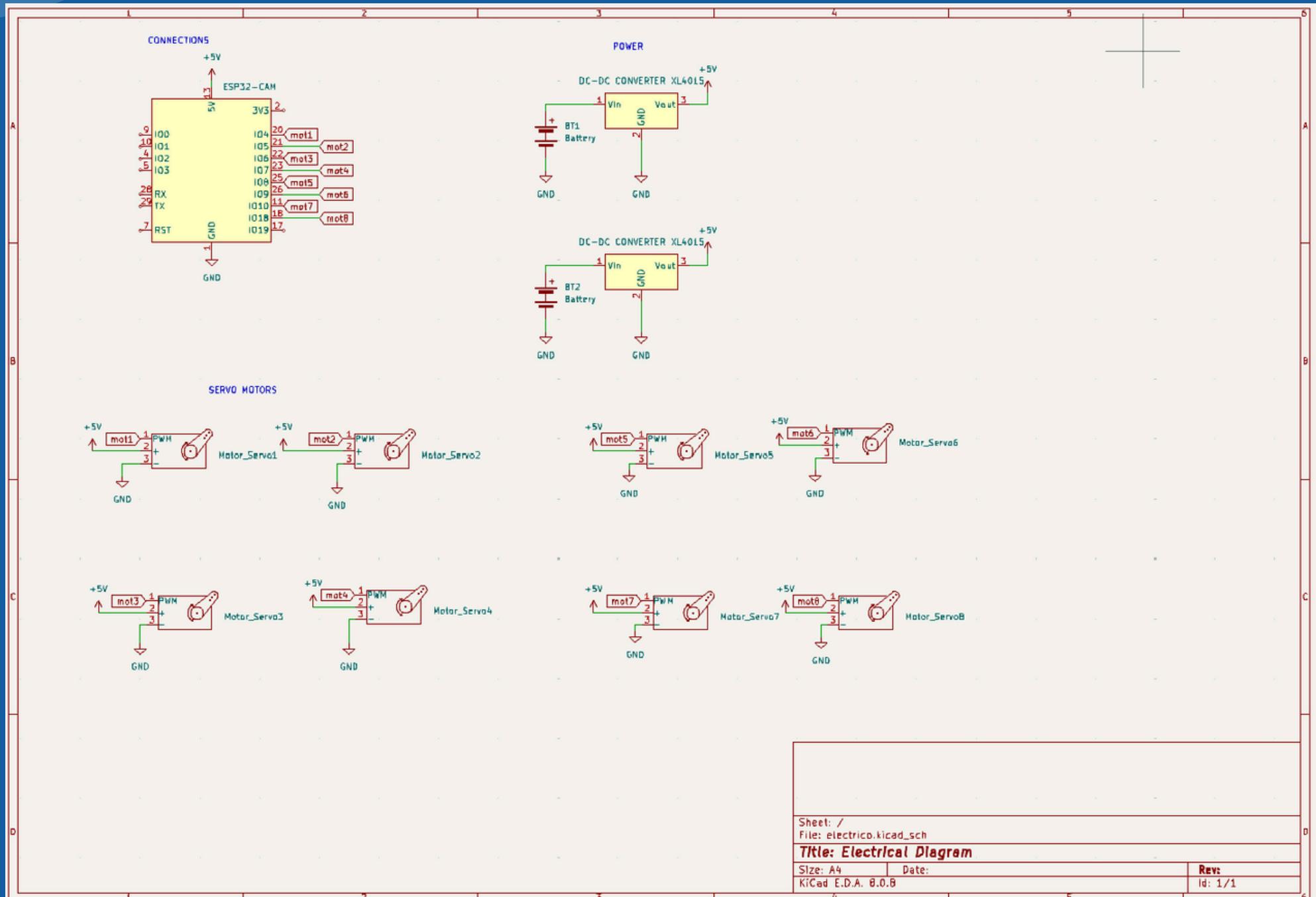


Material



PCB

Electronic



Required intensity:

$$\begin{aligned}8 \text{ servomotors} * 150\text{mA} &/ 1 \text{ servo} = 1.2 \text{ A} \\1 \text{ ESP32-CAM (with streaming)} &= 230\text{m A}\end{aligned}$$

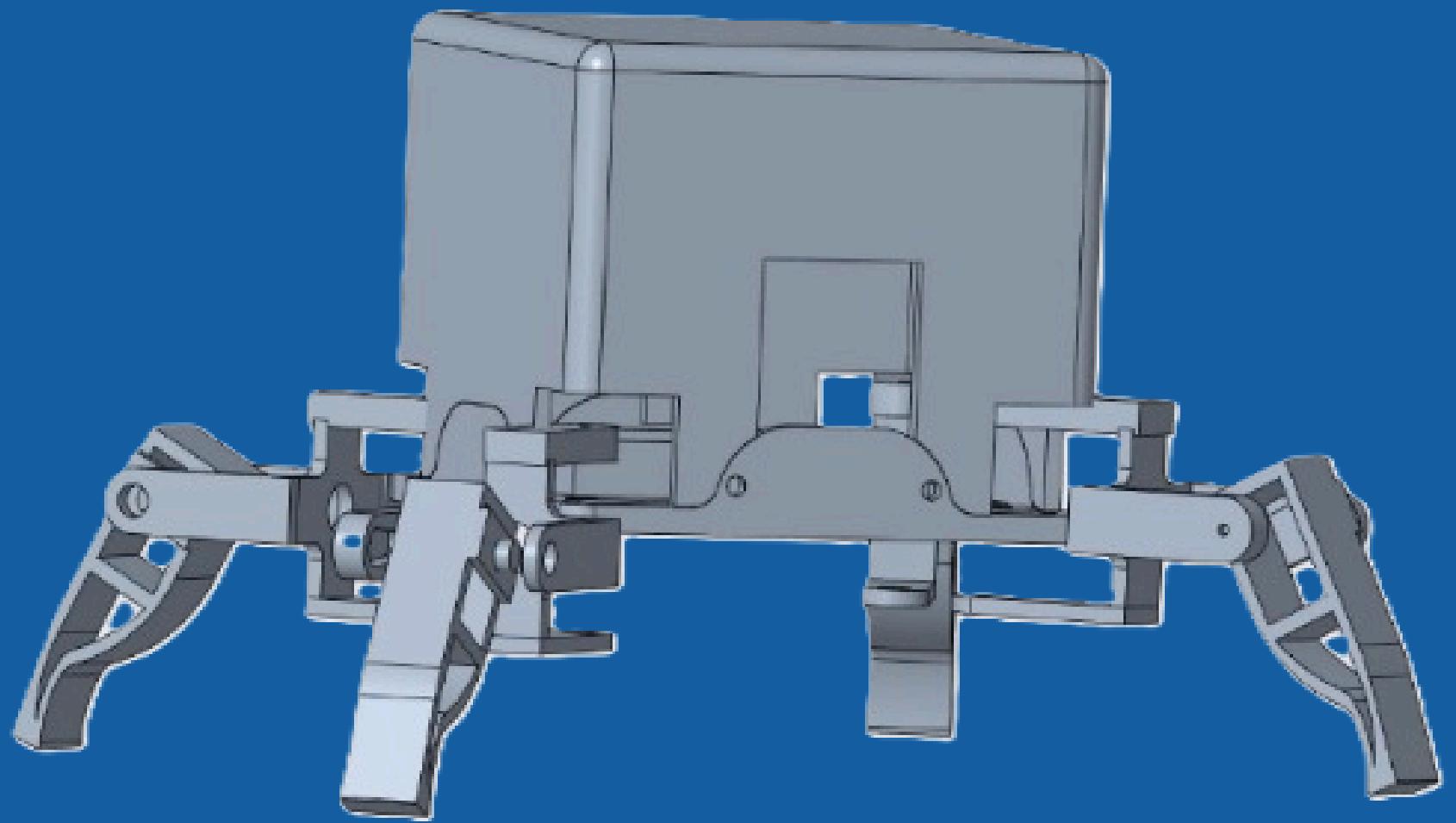
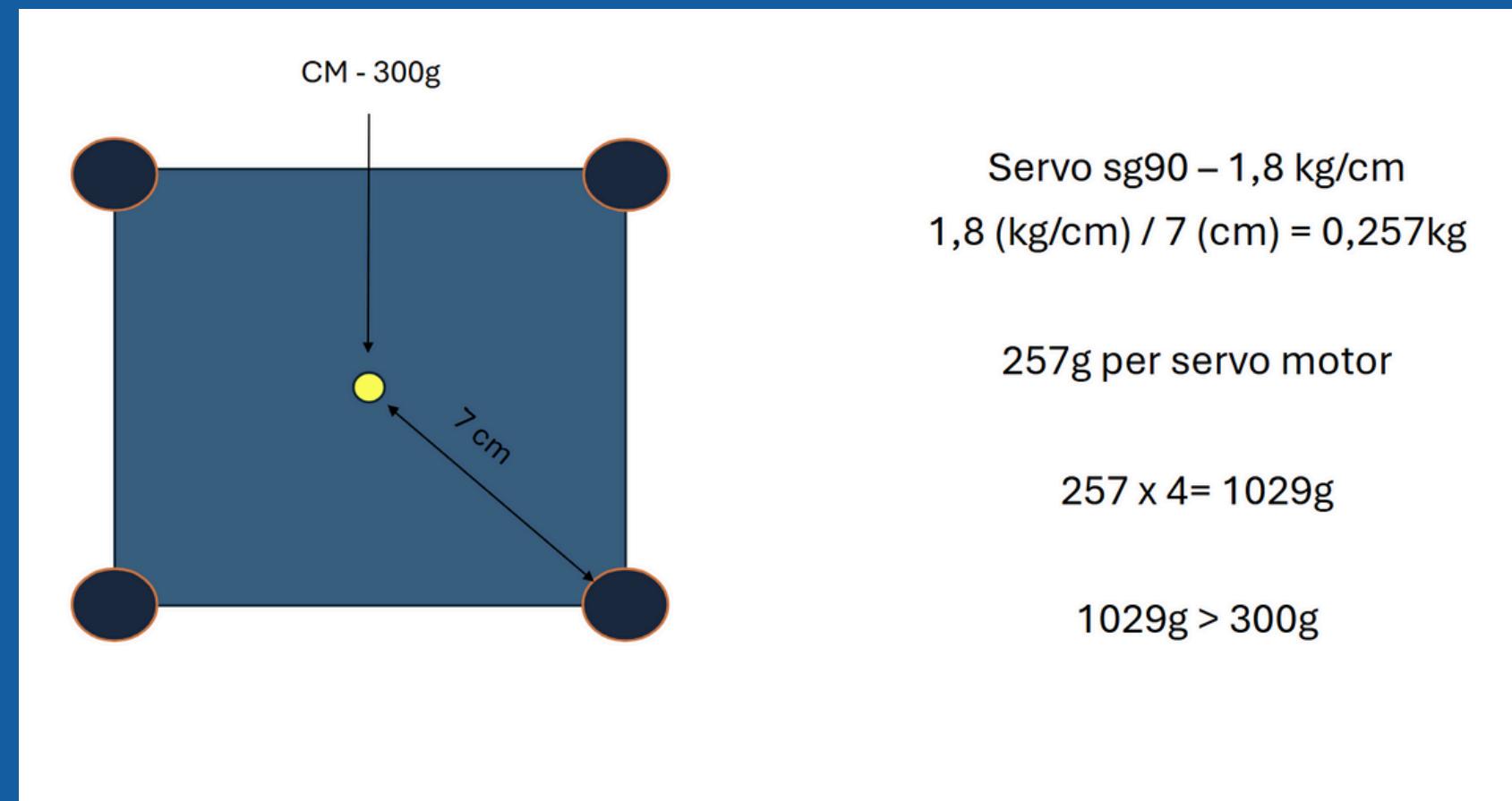
$$\begin{aligned}\text{Worst case intensity} &= 1.43\text{A approx.} \rightarrow \text{Battery } 5 \text{ A} \\C = I \cdot t &= 1.5\text{Ah} \rightarrow \text{Batory } 2 \text{ Ah}\end{aligned}$$

Required voltage:

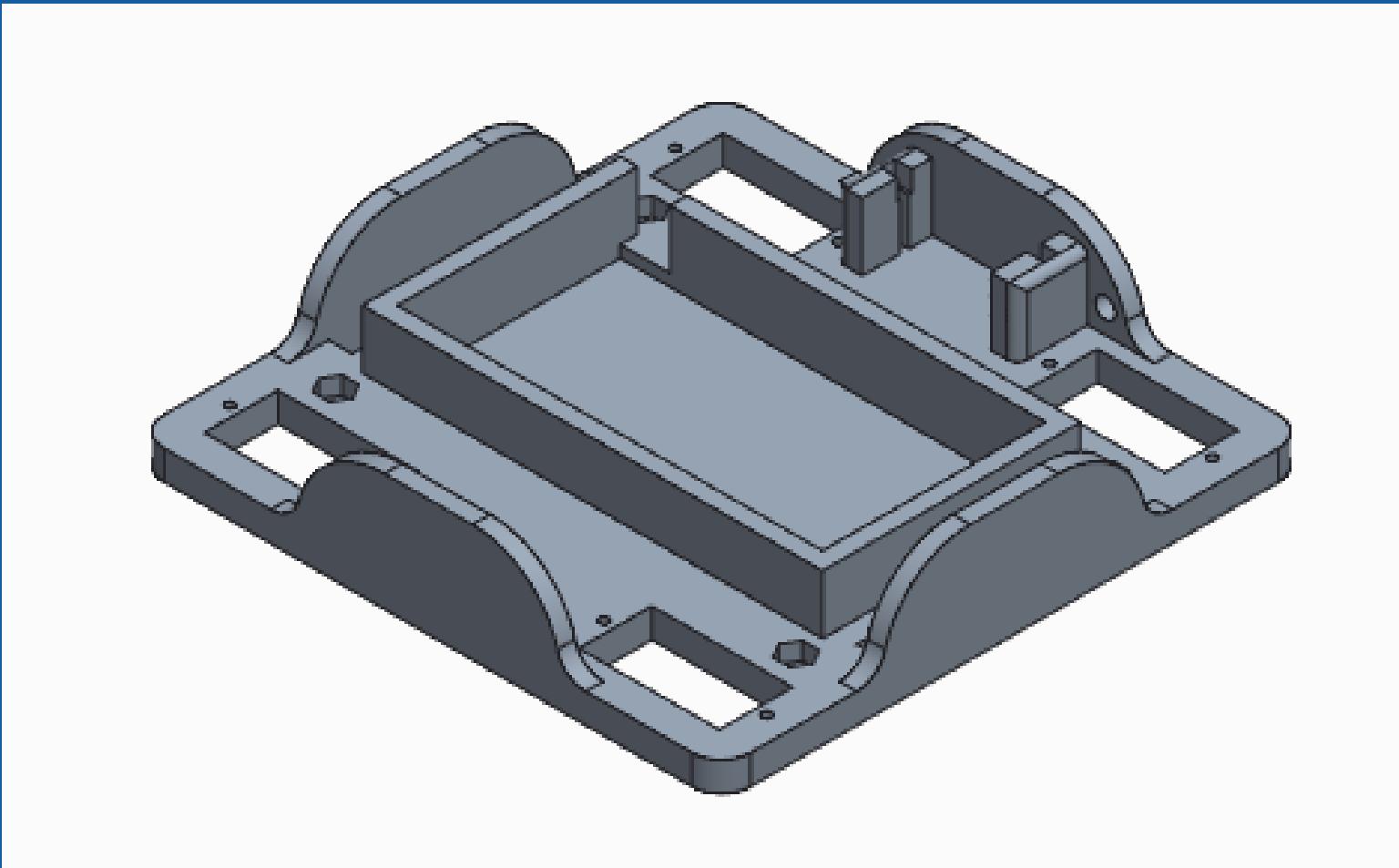
SG90 - 4.8V ~ 6.0V
ESP32-CAM - 5V or 3.3V

Final voltage range → Regulator 7.4V to 5V

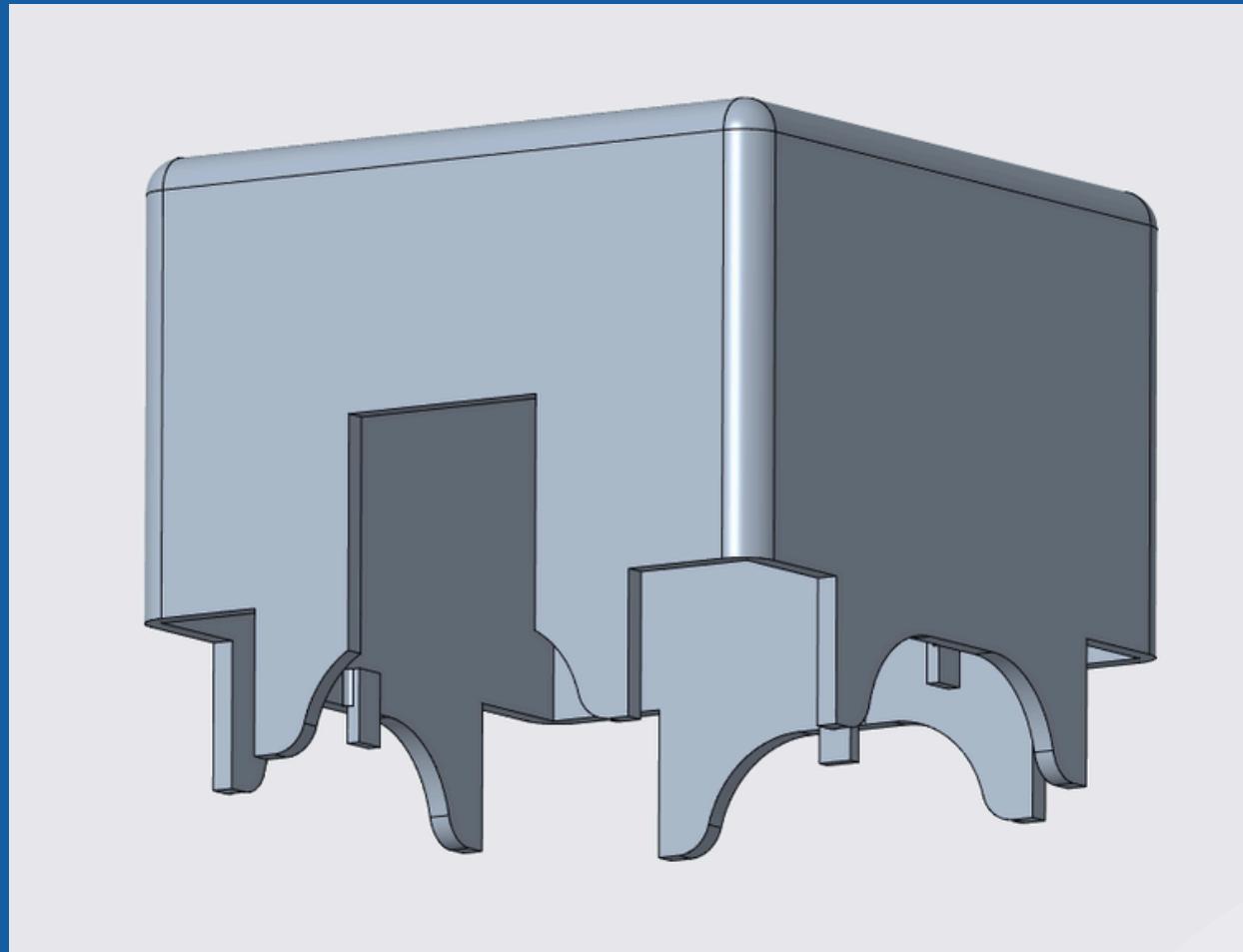
Mechanical



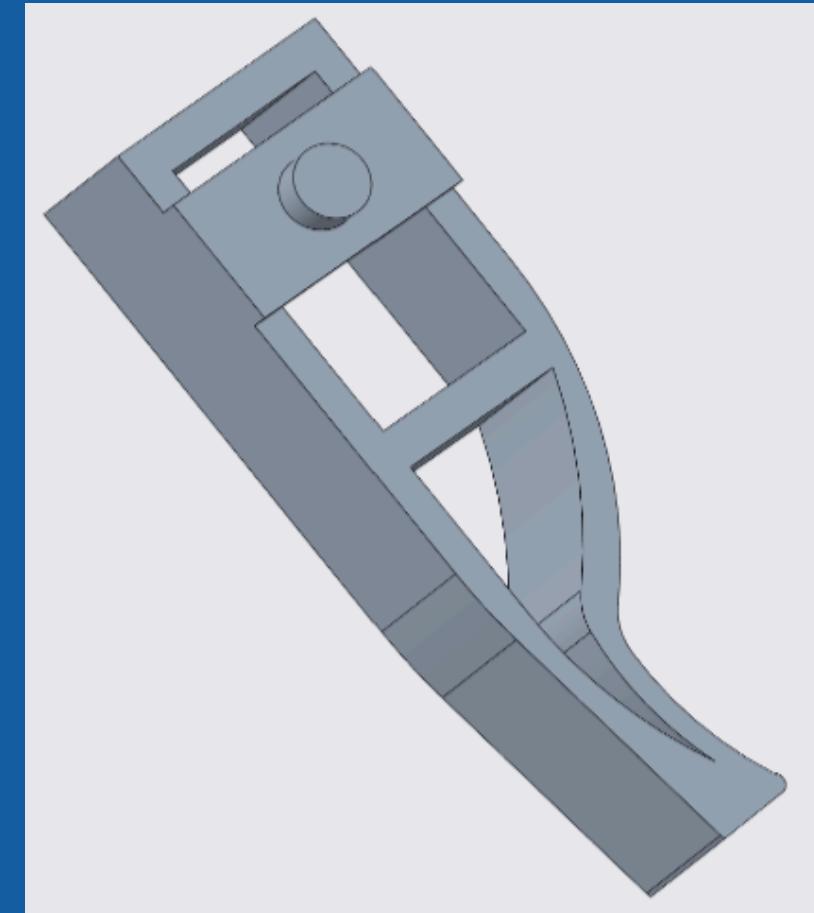
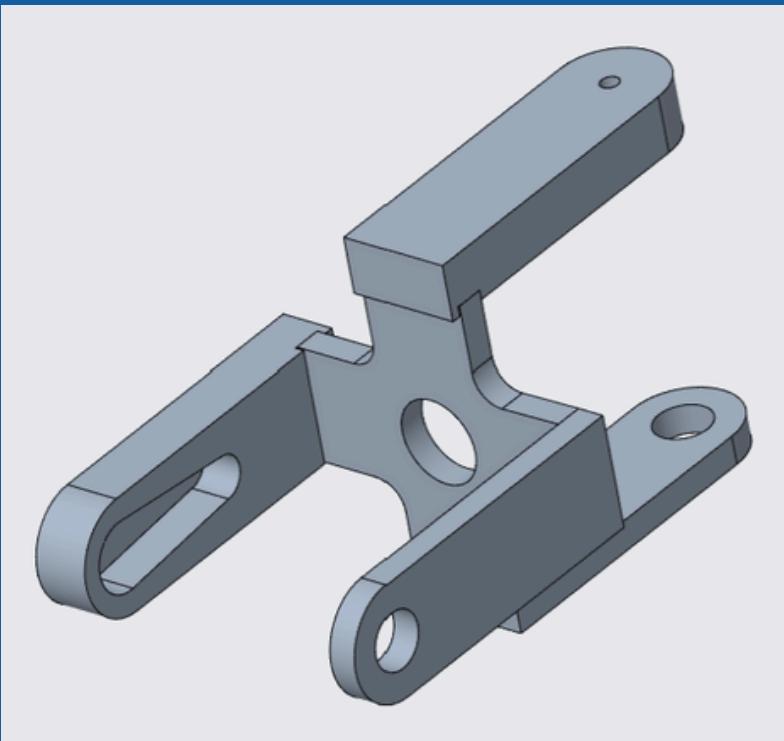
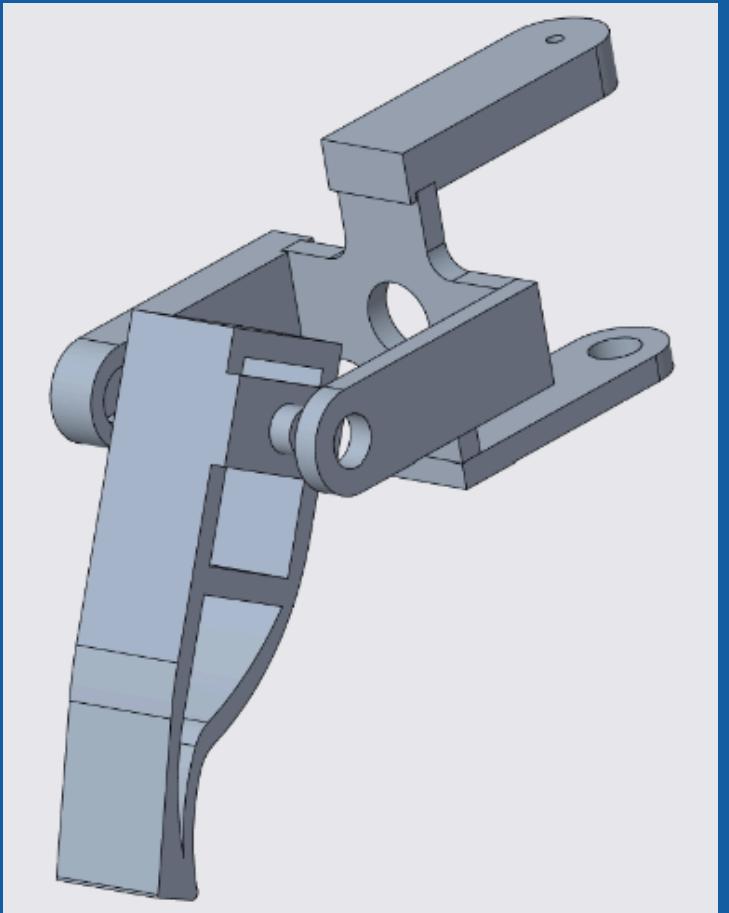
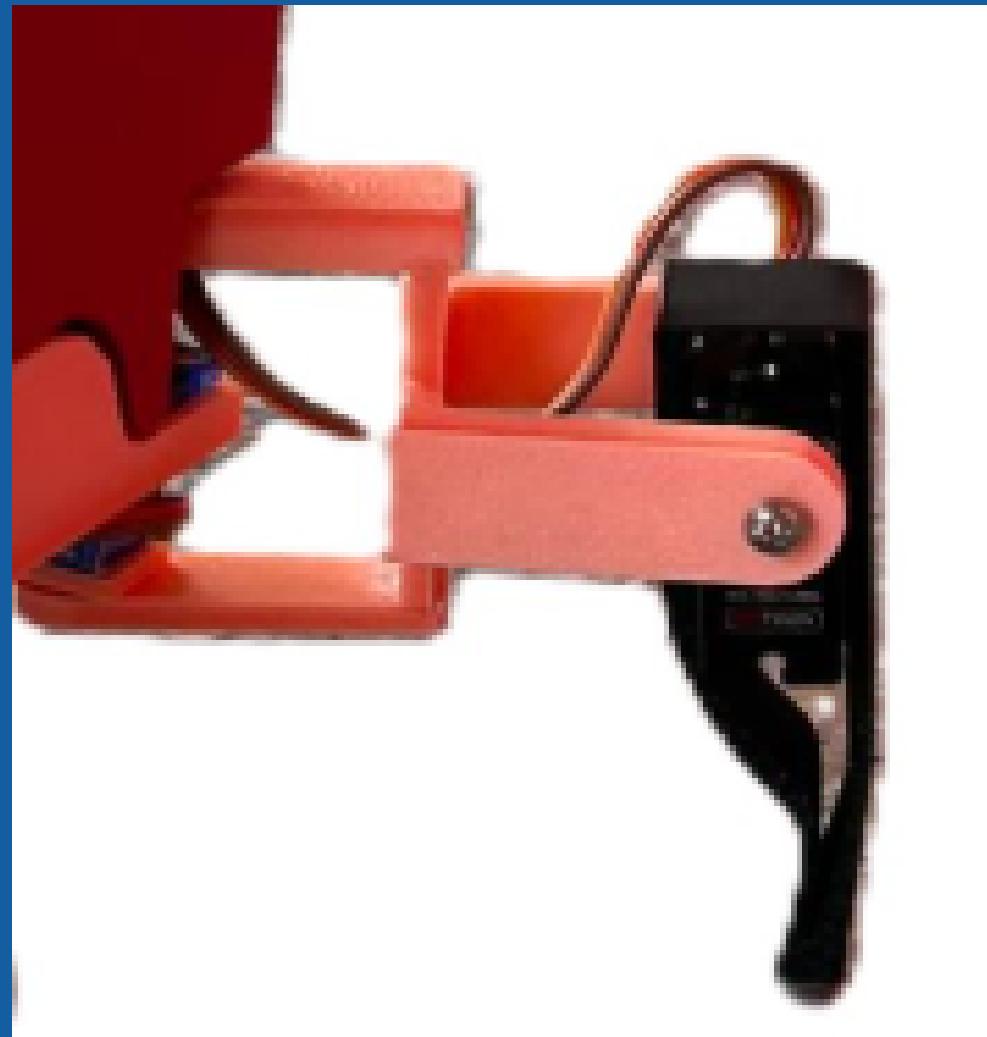
Mechanical Body



Shell



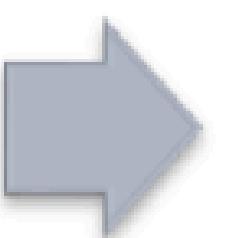
Mechanical Legs



Programming

```
75 void RutaHTML(){  
76     String html = R"rawliteral(  
77         <!DOCTYPE html>  
78         <html>  
  
383     void loop_movement() {  
384         if (loop == 1) {  
385             // Code for movement 1  
386         } else if (loop == 2) {  
387             // Code for movement 2  
388         } else if (loop == 3) {  
389             // Code for movement 3  
390         } else if (loop == 4) {  
391             // Code for movement 4  
392         } else if (loop == 5) {  
393             // Code for movement 5  
394         }  
395         case 1:  
396             mover_adelante();  
397             break;  
398         case 2:  
399             mover_atras();  
400         }  
401     }  
402     }  
403 }
```

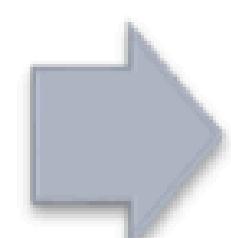
Connection



Command (1, 2, 3, 4 or 5) from web to ESP32-CAM



Program executed



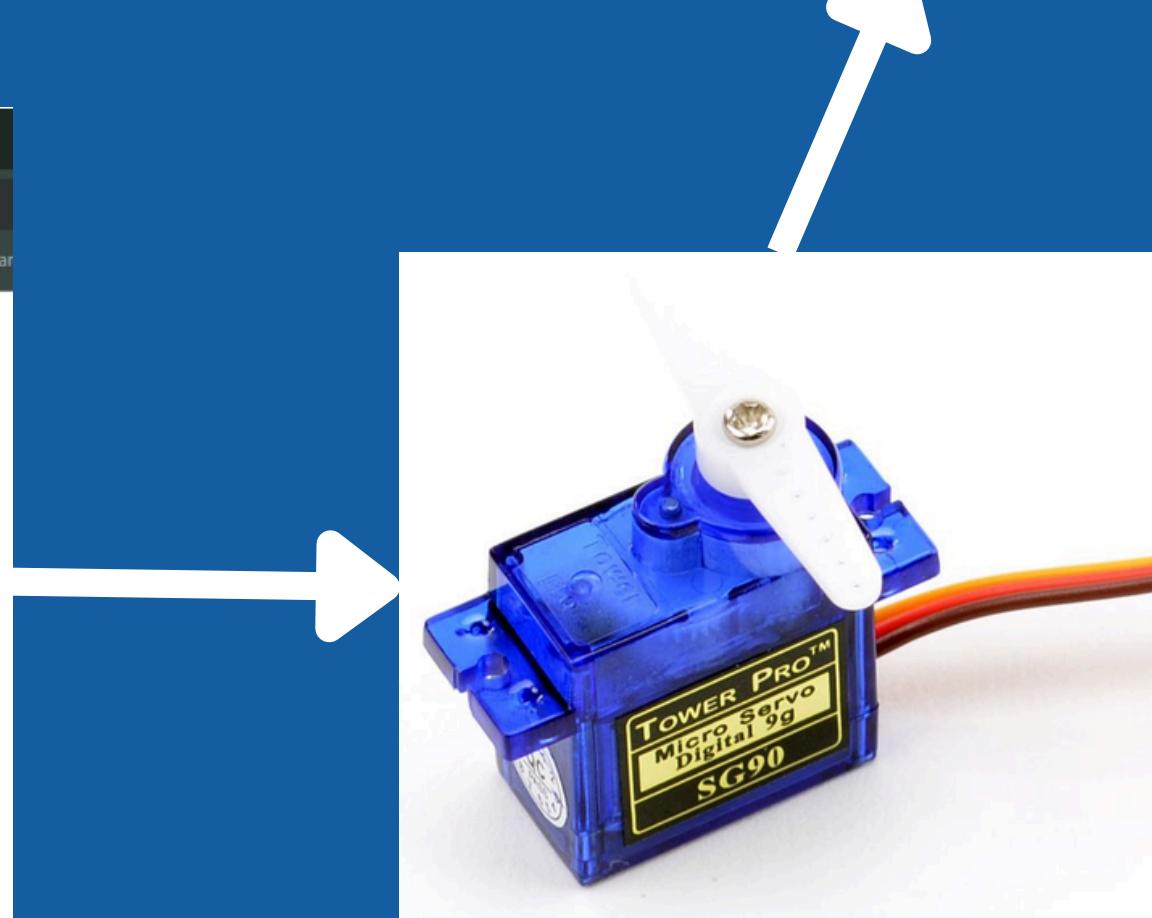
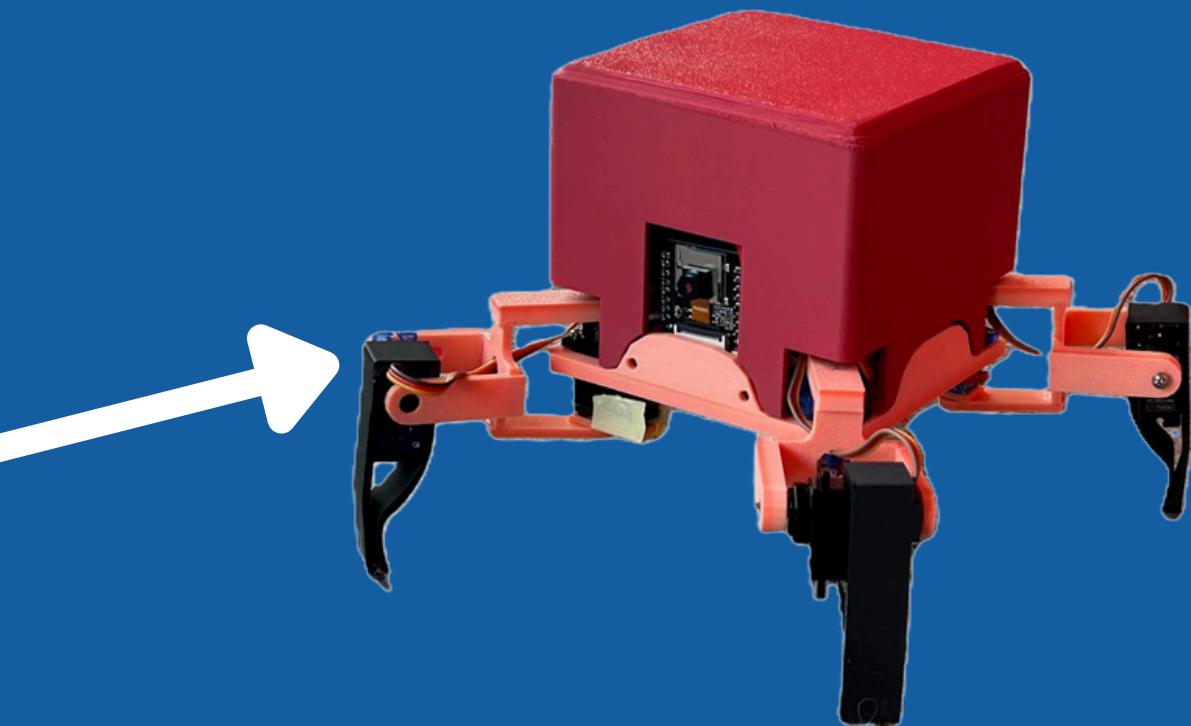
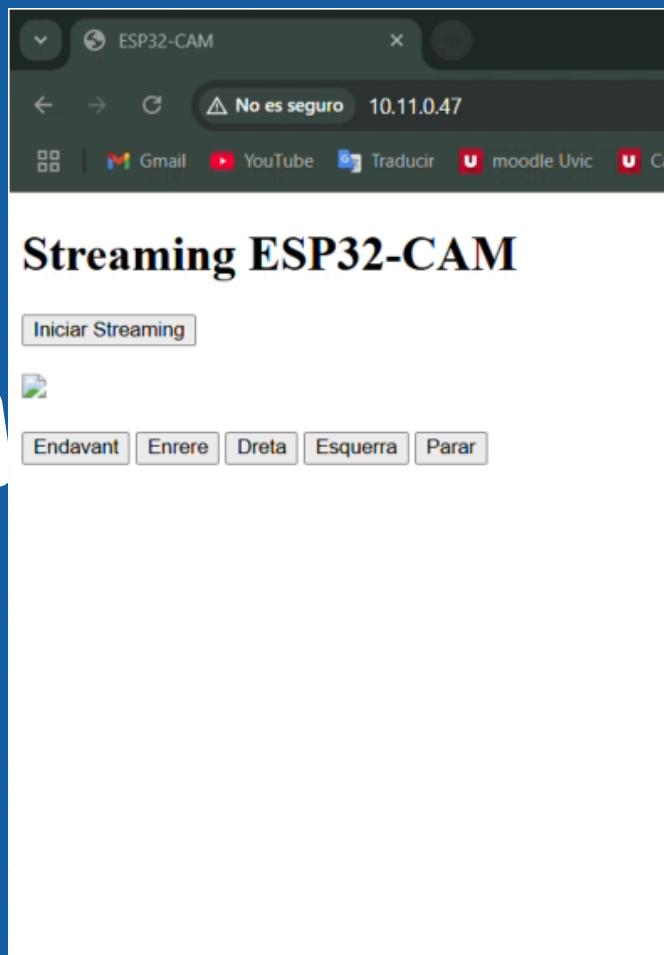
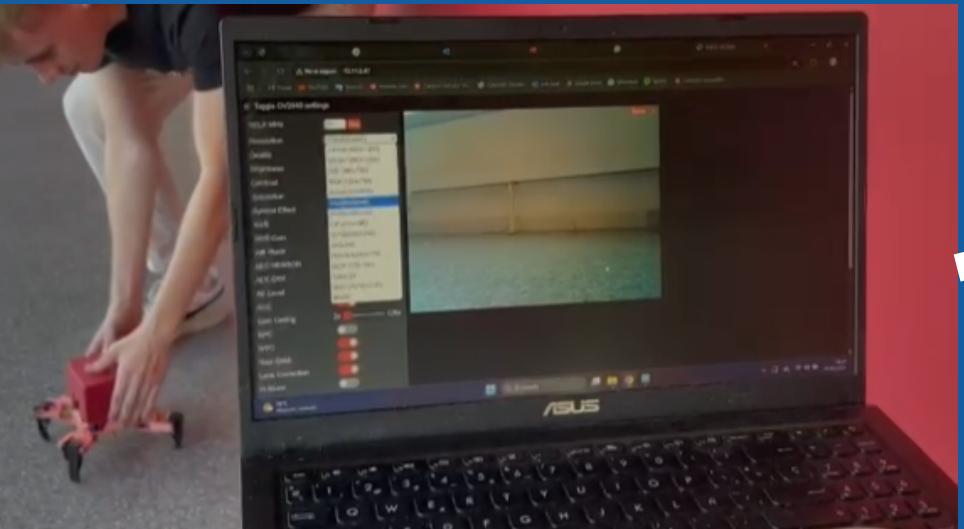
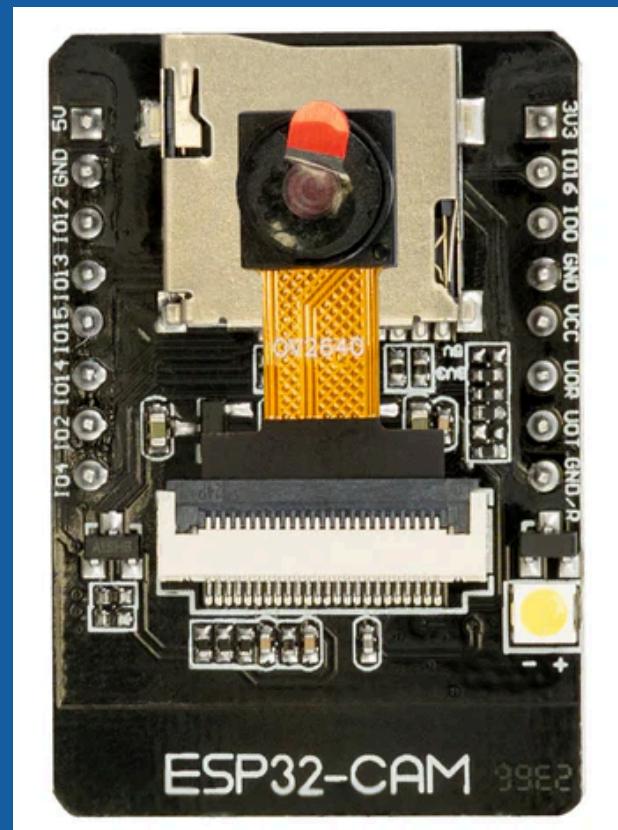
Servomotors move according to the direction of command



```
214     void mover_adelante(void) {  
215         switch(estado_adelante) {  
216             case 0: estado_adelante = 1; break;  
217             case 1:  
218                 spidy.stpt2 = 0;  
219                 spidy.servo2.write(0);  
220                 if(spd़y.stpt2 > 0){  
221                     else{  
222                         break;  
223                     case 2:  
224                         spidy.servo2.write(180);  
225                         if(spd़y.stpt2 > 0){  
226                             else{  
227                                 break;  
228                         case 3:  
229                             spidy.stpt6 = 50;  
230                             spidy.stpt8 = 150;  
231                             if(spd़y.done(1)){  
232                                 else{  
233                                     break;  
234                                     case 4:  
235                                         spidy.servo2.write(0);  
236                                         spidy.servo3.write(180);  
237                                         if(spd़y.stpt6 > 0){  
238                                             else{  
239                                                 break;  
240                                         }  
241                                     }  
242                                 }  
243                             }
```

Spider moves until the command changes

Demonstrators



Budget/Cost

Material Cost

Materials	Cost for unit	Units	Total cost
Servomotor (sg90)	3€	8	24€
Servomotor (sg90S)	4€	5	20€
Battery (7.4V 2Ah)	13€	2	25,99€
Camera Wi-Fi ESP32	14,99€	1	14,99€
Voltage regulator (5V)	2,99€	1	2,99€
3D Print PLA	16€	1	16€
Wooden board	1,81€	1	1,81€
TOTAL			105,78€

Development Cost

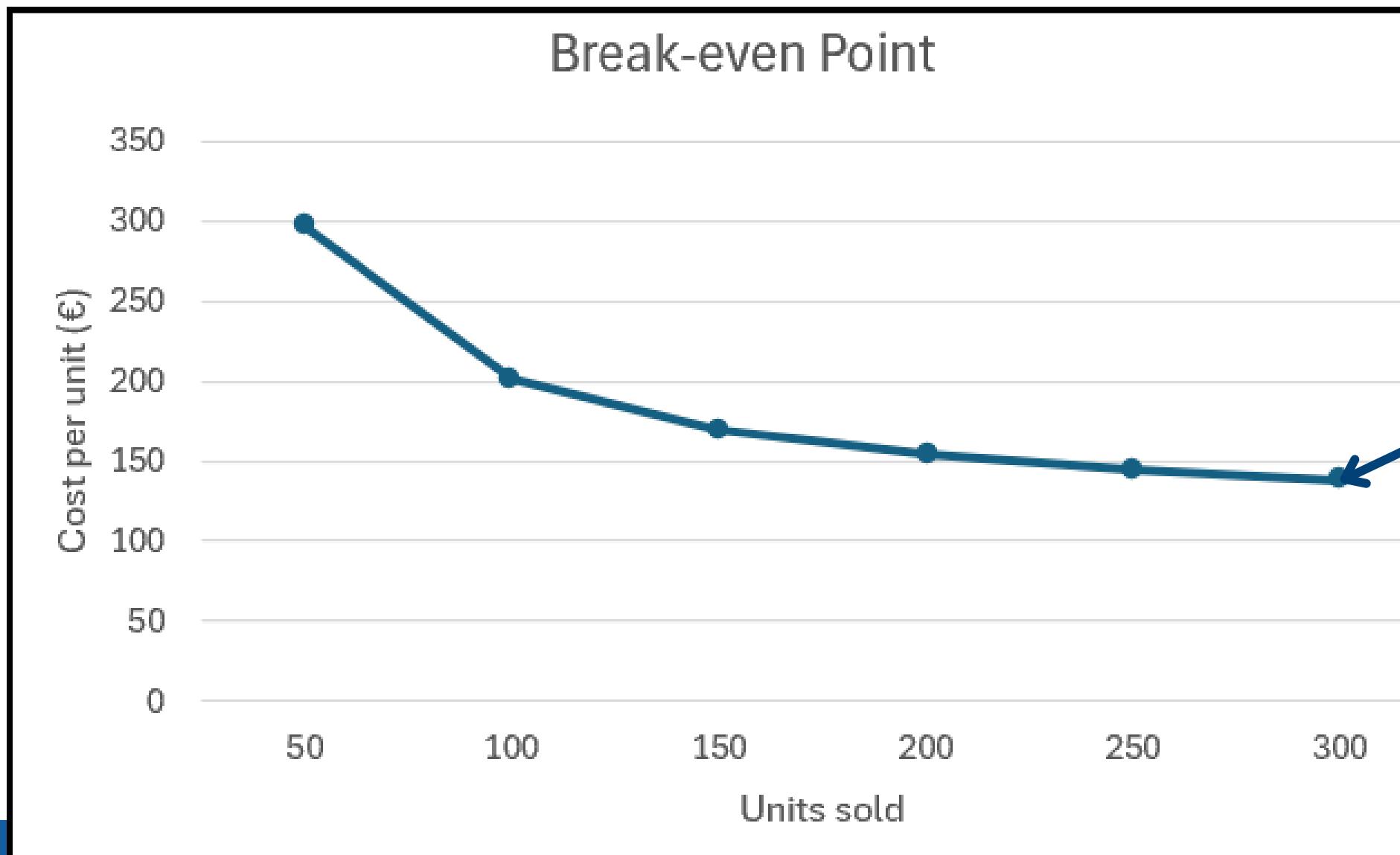
Sprints\ Member	Òscar Guerrero	Maria Schreiber	Sergi Piguillem	Roger Camps
Sprint 1	5:30 h	8 h	8:30 h	8 h
Sprint 2	9 h	11 h	8:30 h	9 h
Sprint 3	9 h	10 h	8:30 h	9 h
Sprint 4	10 h	11:30 h	9 h	12 h
Sprint 5	8 h	10 h	8 h	10 h
Sprint 6	20 h	14 h	14 h	14 h
Sprint 7	21 h	18 h	19 h	18 h
Total hours per member	82:30 h	82:30 h	75 h	80 h
Total group hours	318 h	30€/h	9.540€	

Break-even Analysis

Spider Robot price

30% margin on
material cost

138€

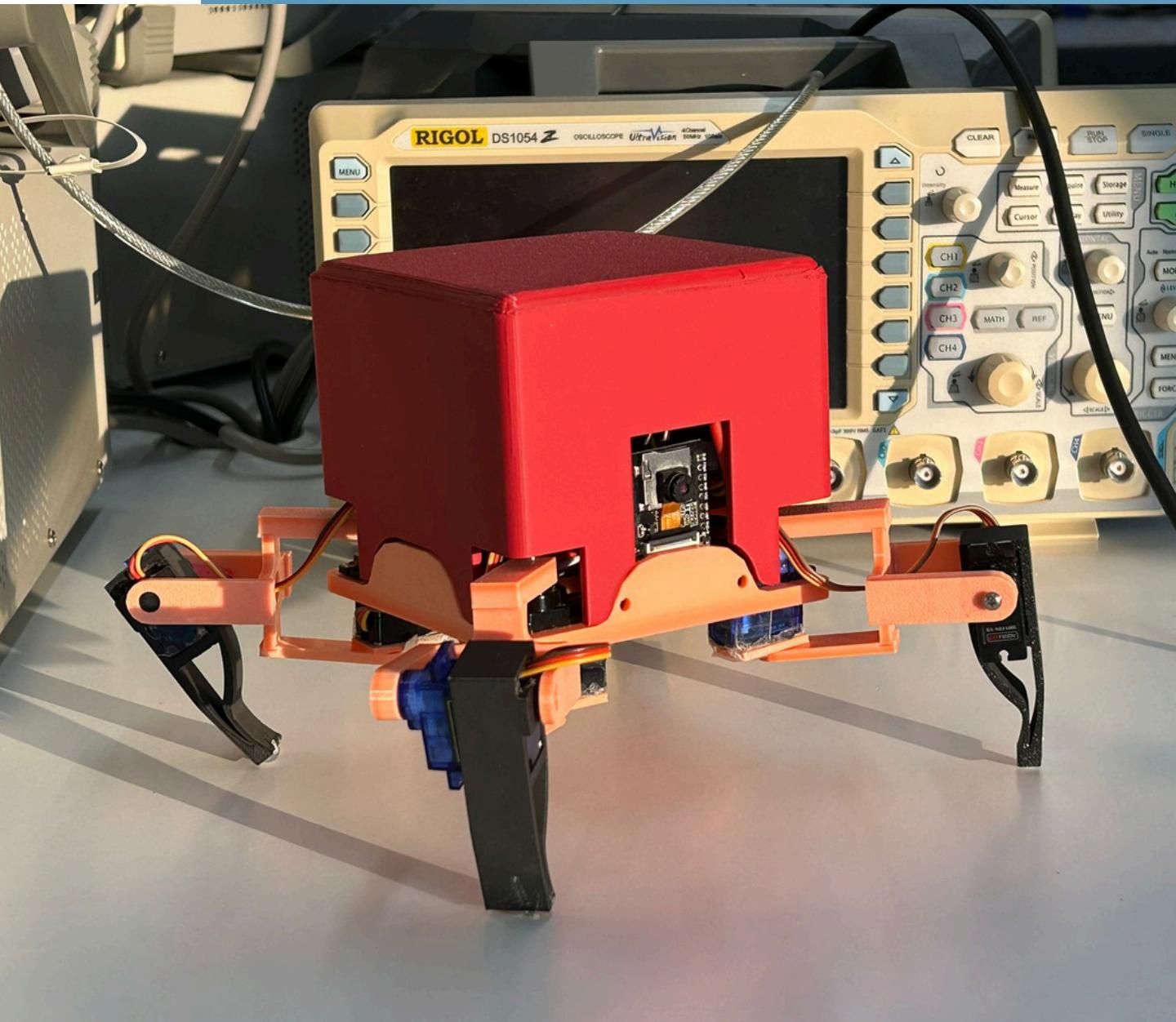


300 units sold
137,8€ cost/unit

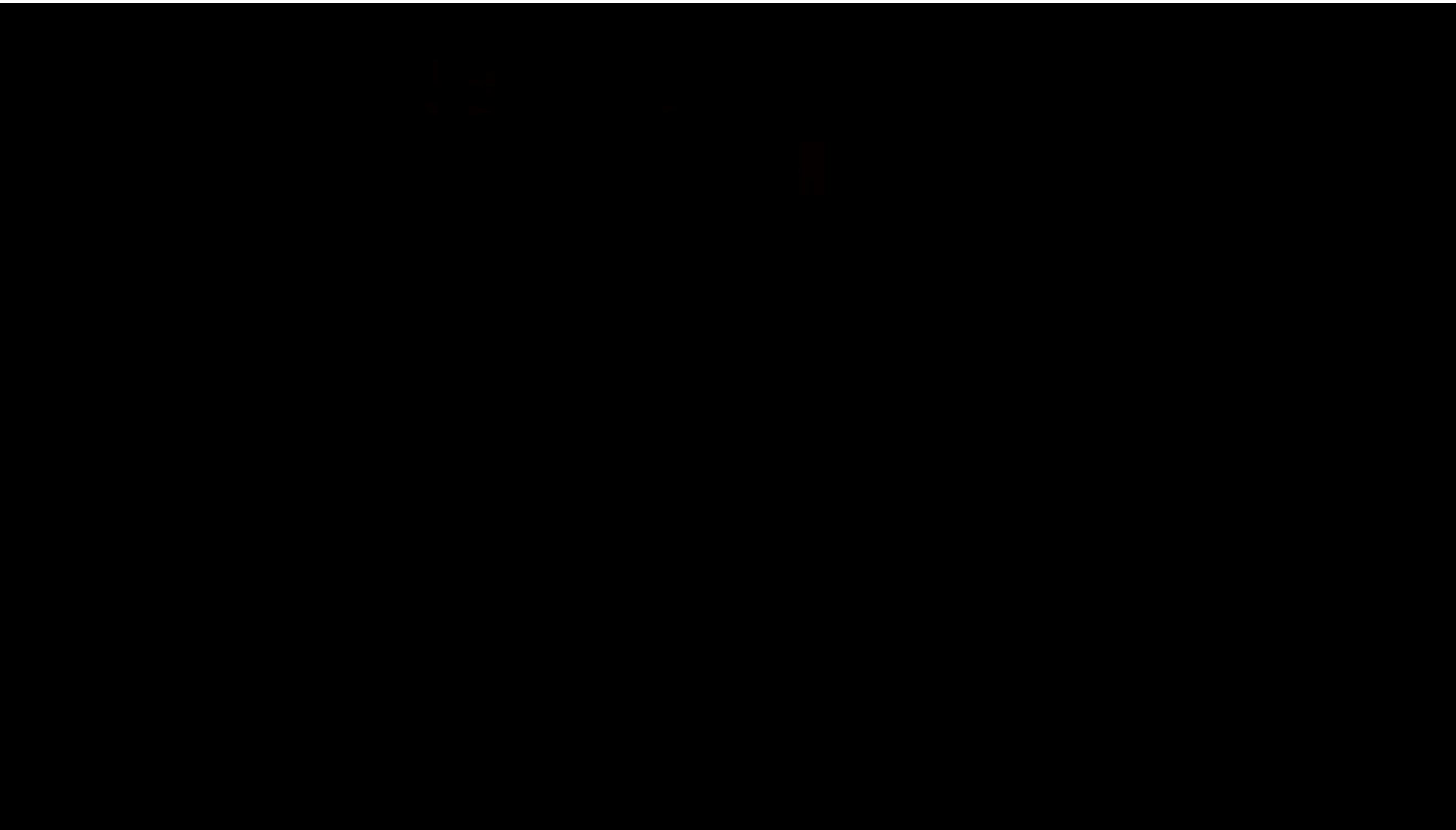
WEBSITE



[HTTPS://GITHUB.COM/INTEGRATED-
PROJECT-2-2025-UVIC-UCC/GROUP-
1](https://github.com/integrated-project-2-2025-uvic-ucc/group-1)



PROMOTIONAL VIDEO



Conclusions

Adaptation and problem solution

Modified code and mechanical design

Achieved objectives

Movement

Size

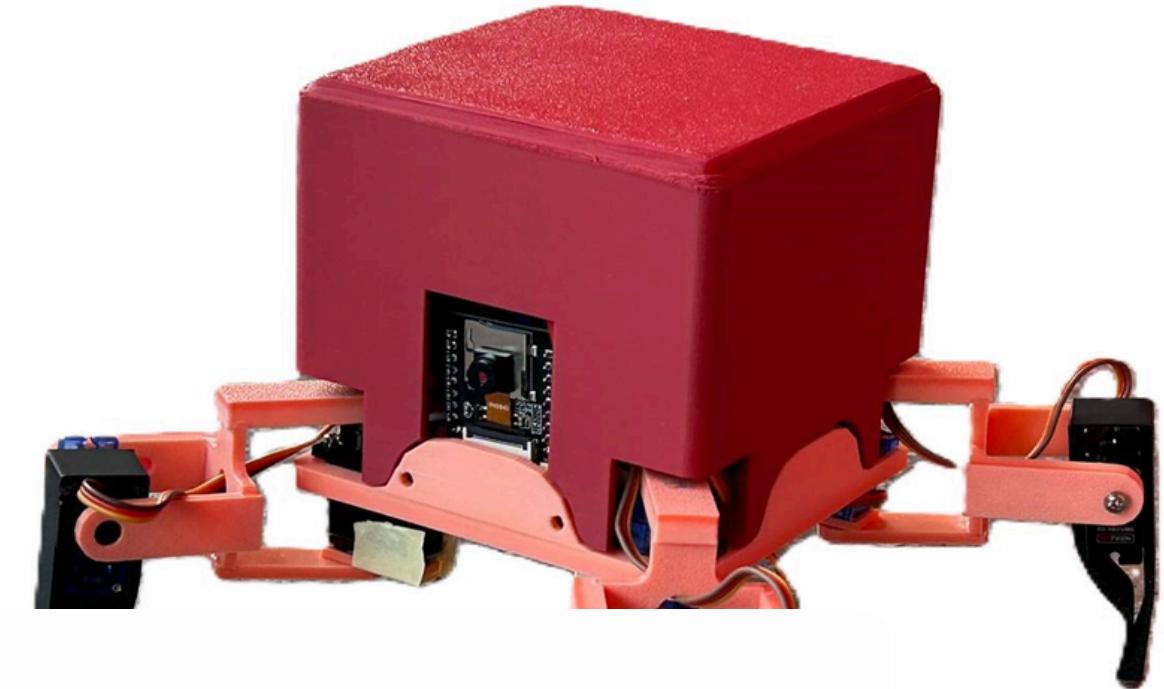
Autonomy

Result

Walking spider

Stable

Remotely controlled



References

01

Arduino, ESP32Servo, Kevin Harrington (2025)
from:
<https://docs.arduino.cc/libraries/esp32servo/>

02

ESP32-CAM, Naylamp Mechatronics SAC (2023)
from:
<https://naylampmechatronics.com/espressif-esp/700-esp32-cam-con-camara-ov2640-esp32-wifi-base-ch340.html>

03

Battery capacity, Nature's Generator from:
https://naturesgenerator.com/blogs/news/how-to-measure-battery-capacity?srsltid=AfmBOorP06CTvTiYV6YFeHxgS37RSpJnvKaujZtnvRZr_HzMK5kSpNjq

Questions

