

# ROBÓTICA EDUCACIONAL

Atividades com o  
Kit Criatecno CT100

## FIGURAS



Figura 1.1 - Placa Arduino Uno.

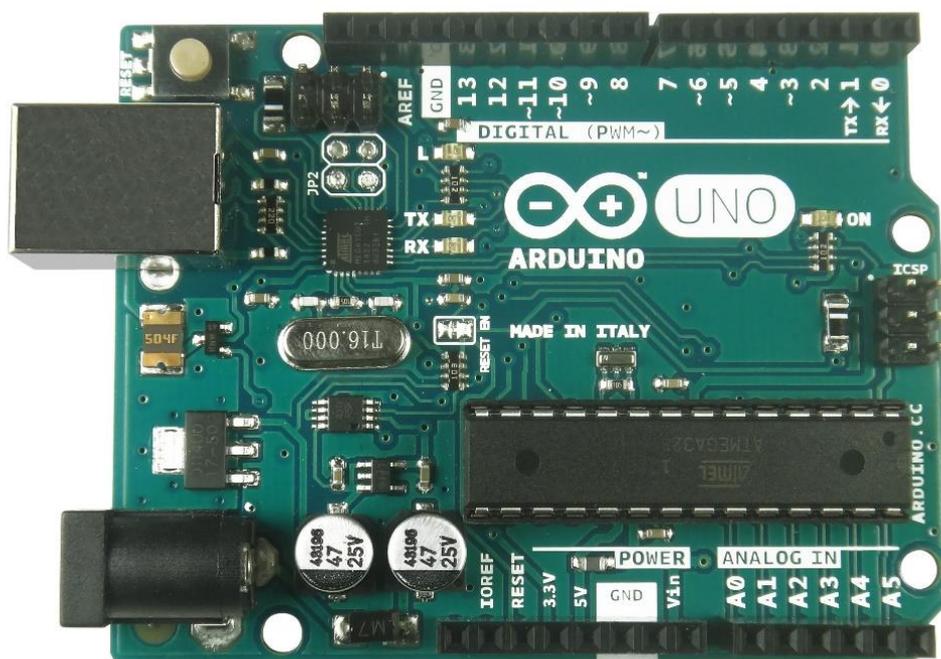


Figura 1.2 - Interface gráfica do Arduino IDE.

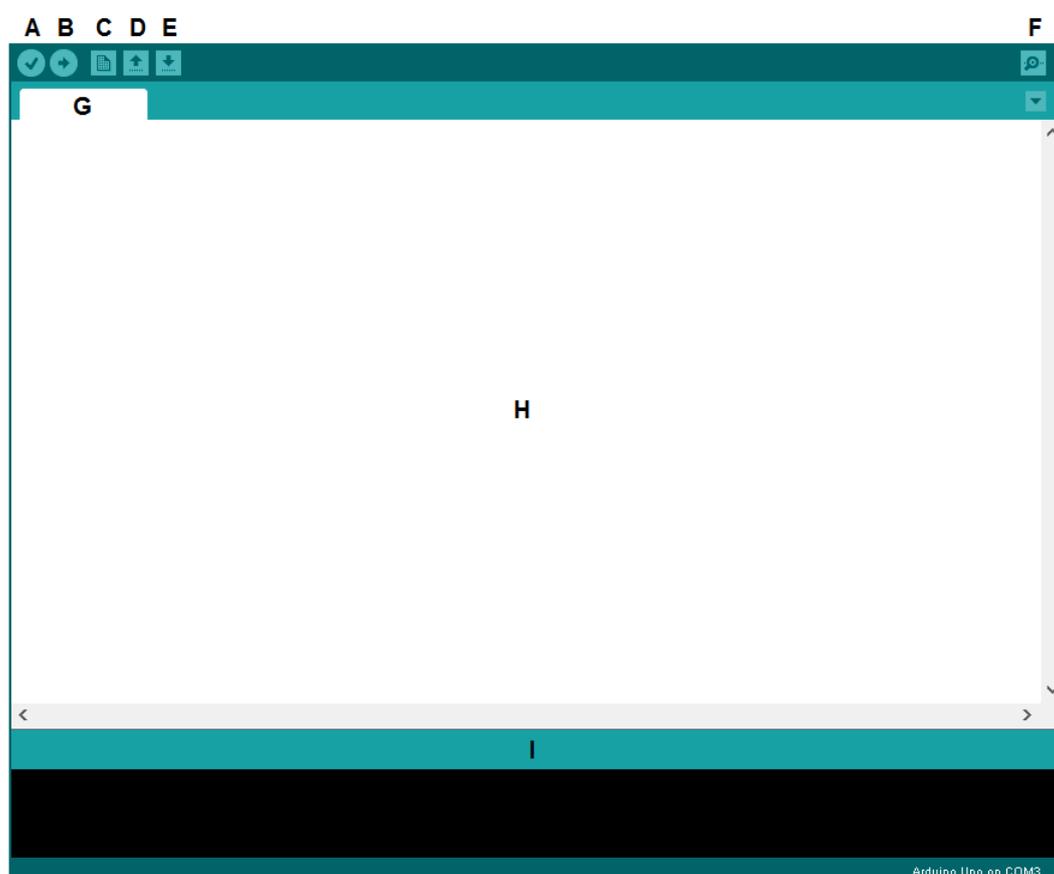


Figura 1.3 - Conectando a placa Arduino no computador.



Figura 1.4 - Definindo a placa Arduino a ser utilizada.

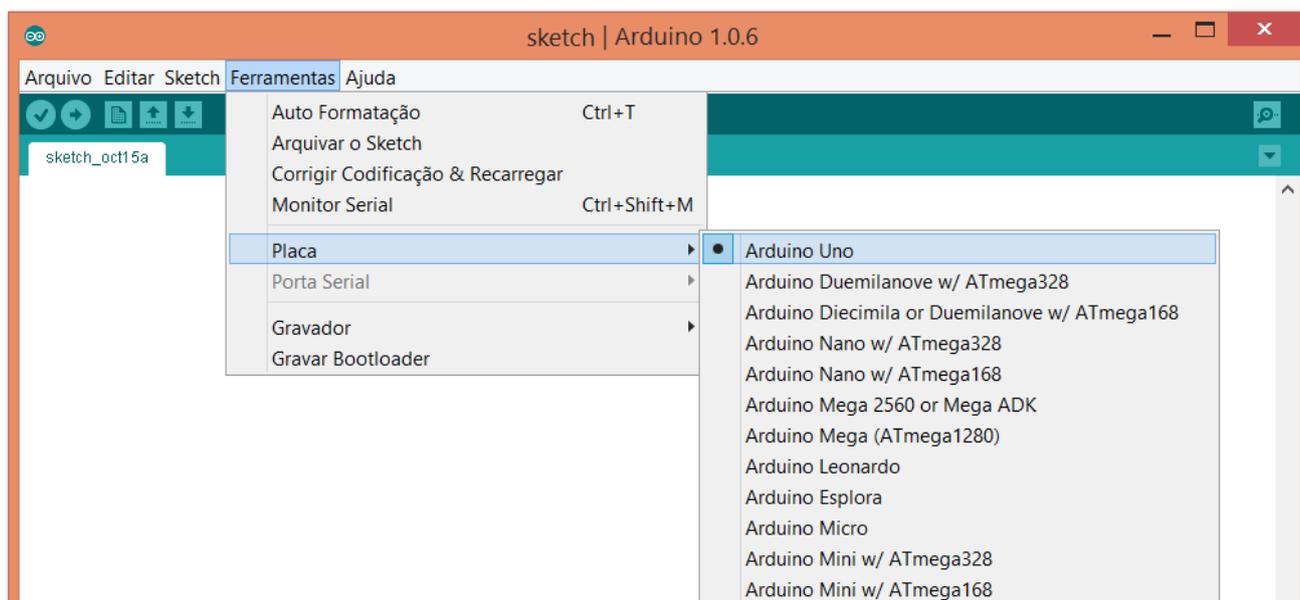


Figura 1.5 - Selecionando a porta serial onde a placa Arduino está conectada.

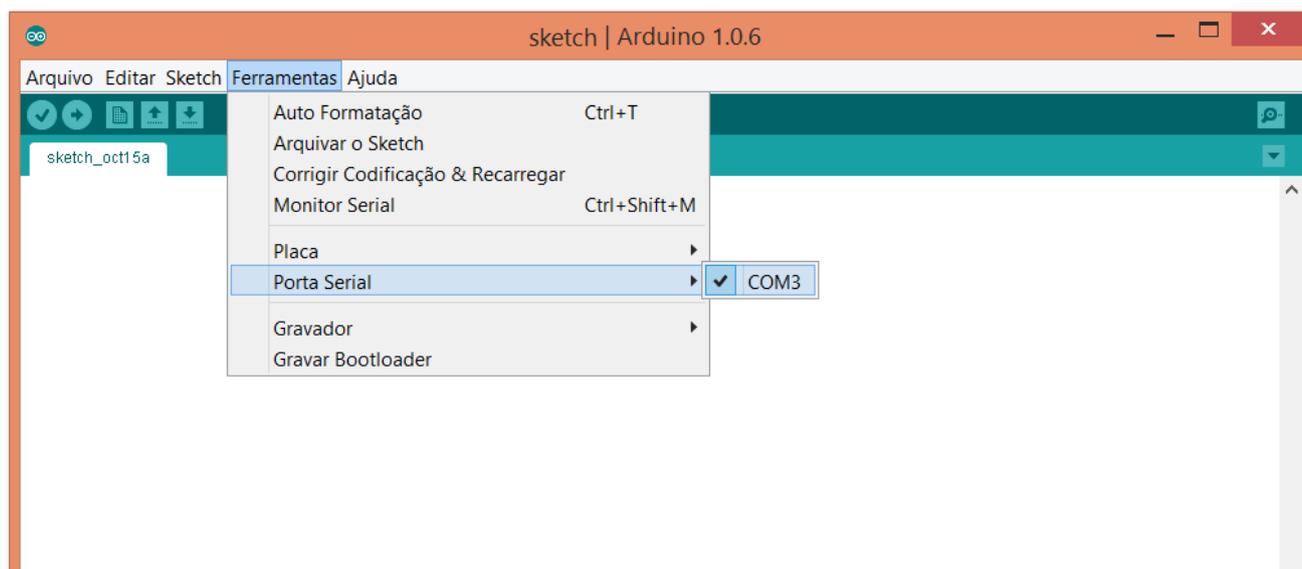


Figura 1.6 - Abrindo o sketch Blink.

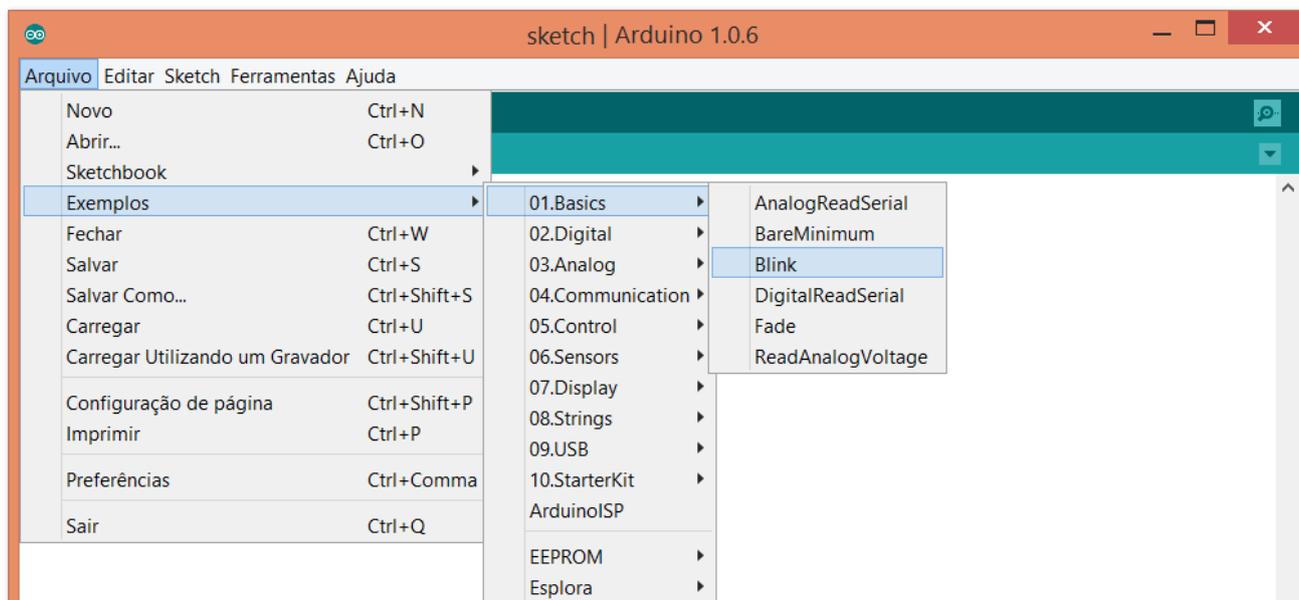


Figura 1.7 - Inserindo os parafusos na placa controladora Arduino.

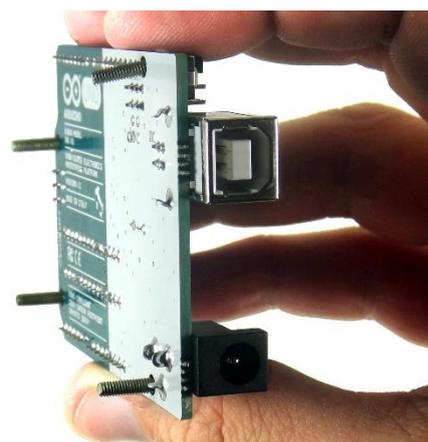
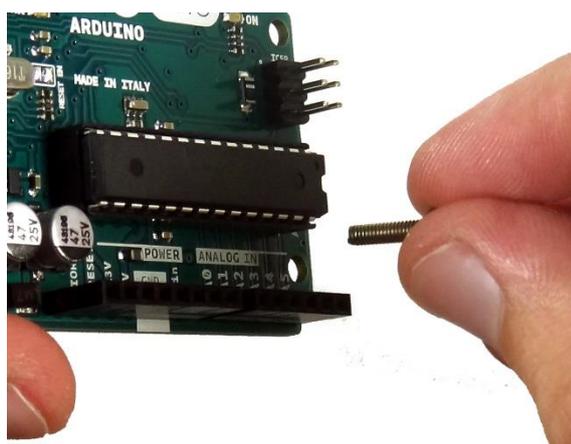


Figura 1.8 - Encaixando os espaçadores nos parafusos.

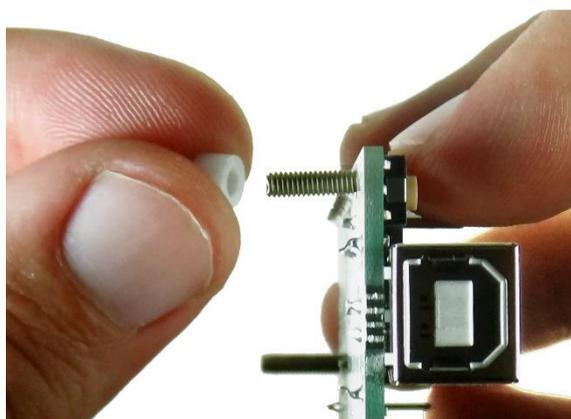


Figura 1.9 - Inserindo os parafusos na base de prototipagem.



Figura 1.10 - Fixando a placa Arduino na base de prototipagem.

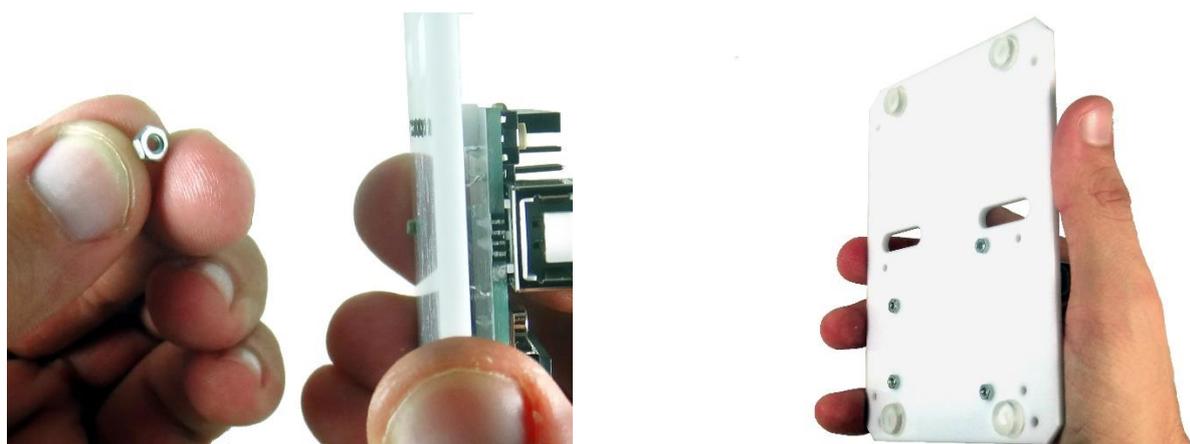


Figura 1.11 - Placa Arduino fixada na base de prototipagem.



Figura 1.12 - Ligações entre a placa Arduino e a protoboard.

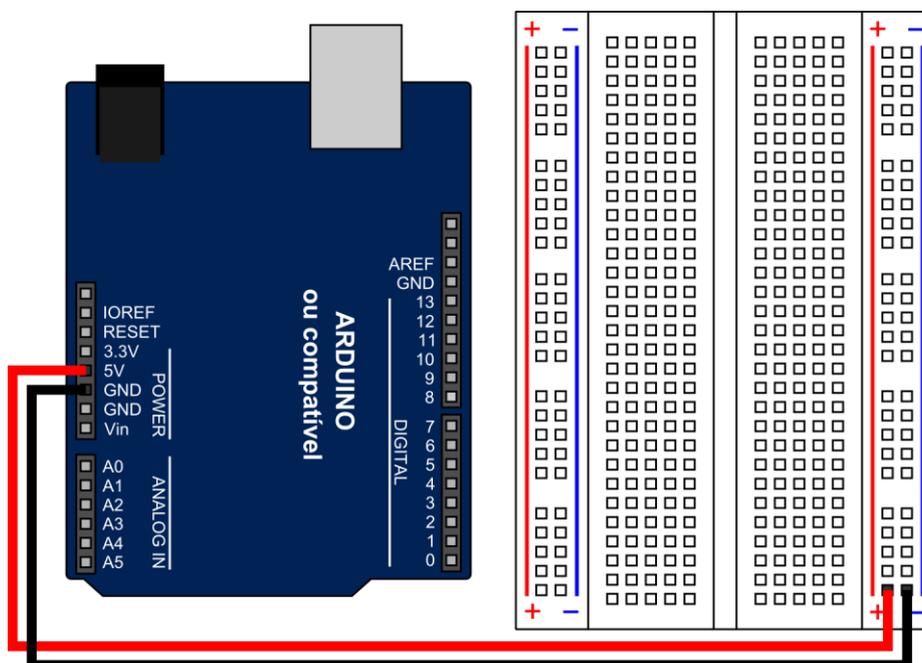


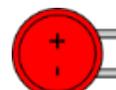
Figura 2.1 - (a) Imagem de um LED, (b) seu símbolo no esquema dos circuitos e (c) a figura que o representa na ilustração dos circuitos montados.



(a)



(b)



(c)

Figura 2.2 - (a) Imagem de um resistor, (b) seu símbolo no esquema dos circuitos e (c) a figura que o representa na ilustração dos circuitos montados.



(a)

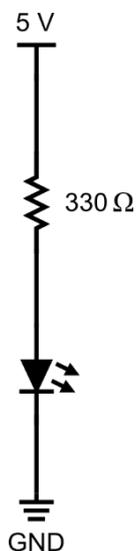


(b)

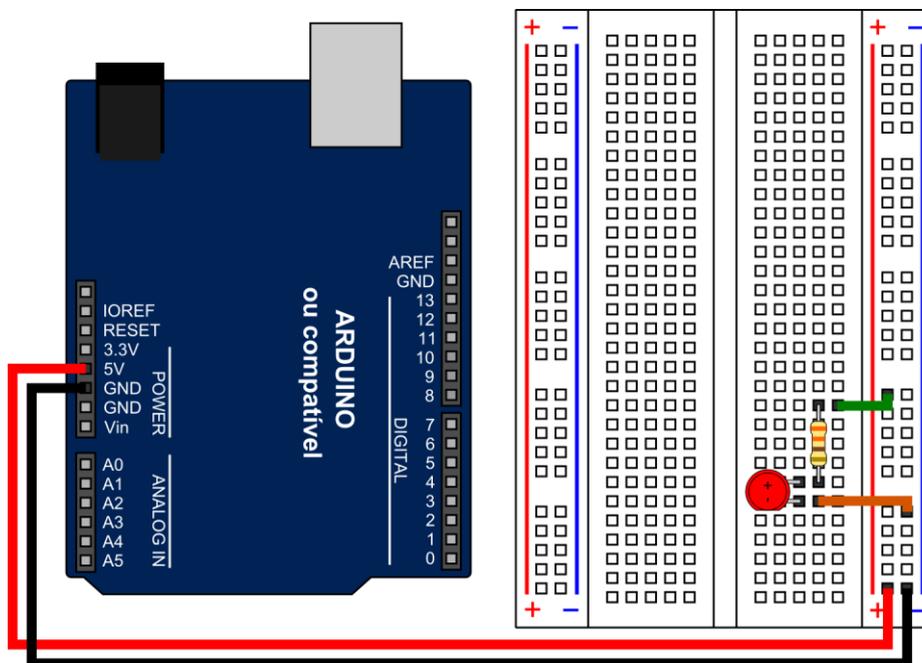


(c)

Figura 2.3 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 1.

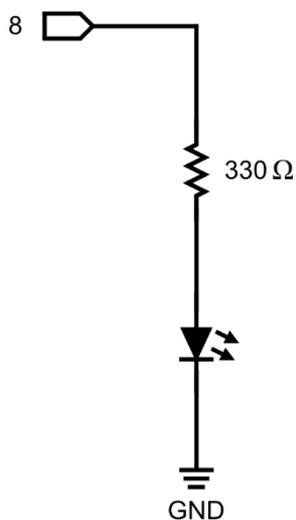


(a)

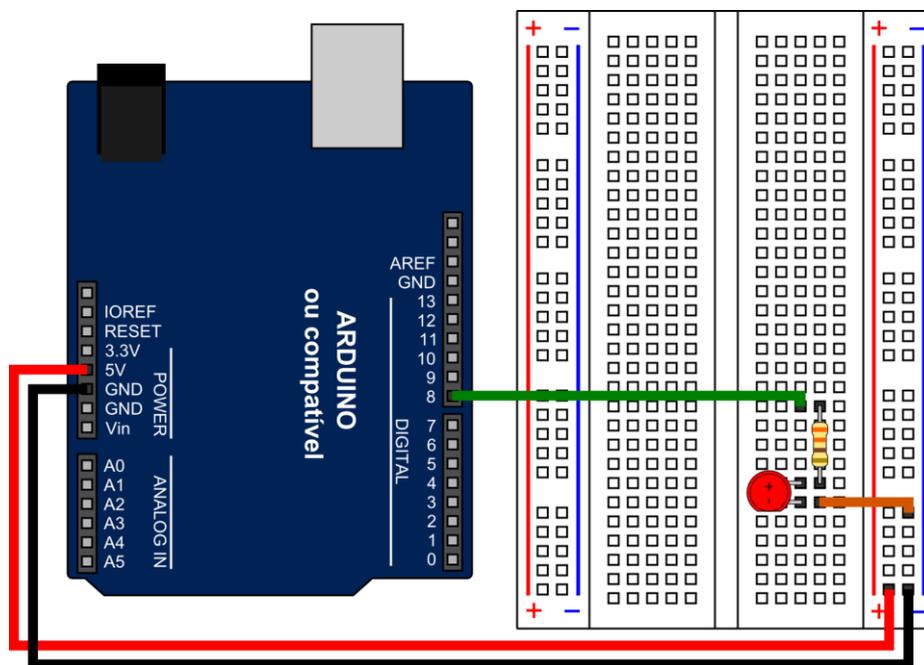


(b)

Figura 2.4 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 2.

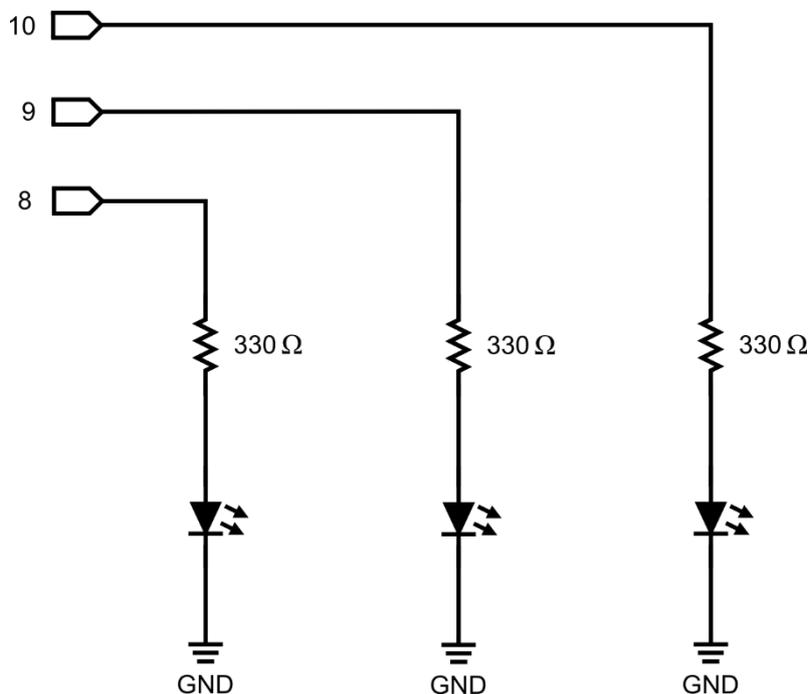


(a)

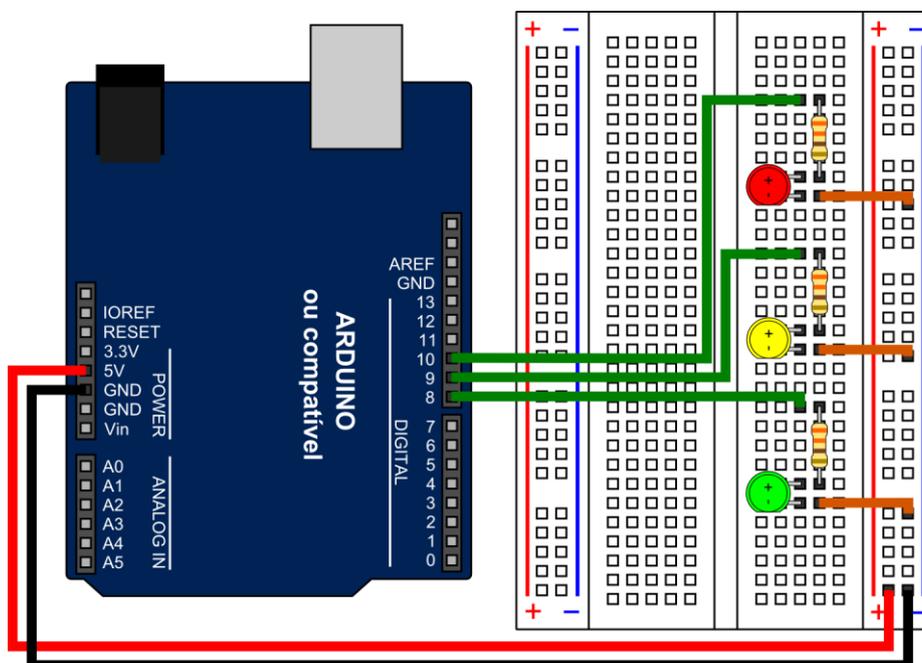


(b)

Figura 2.5 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 4.

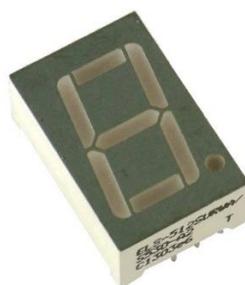


(a)

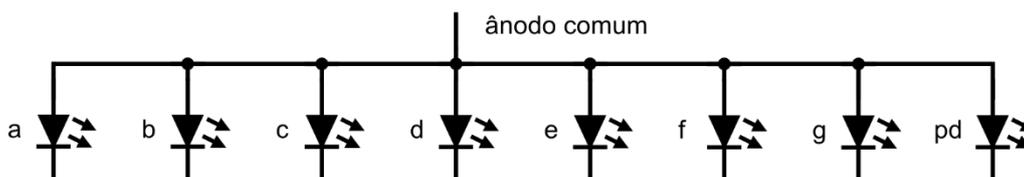


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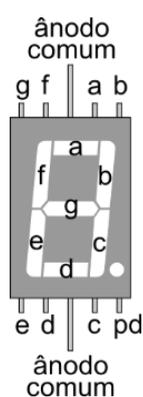
Figura 2.6 - (a) Imagem de um display de sete segmentos, (b) seu símbolo no esquema dos circuitos e (c) a figura que o representa na ilustração dos circuitos montados.



(a)



(b)



(c)

Figura 2.7 - Relação dos segmentos do display que devem ser acesos em função do número desejado.

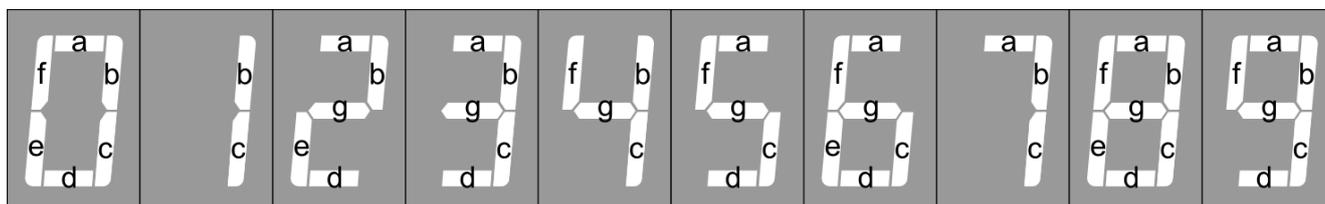
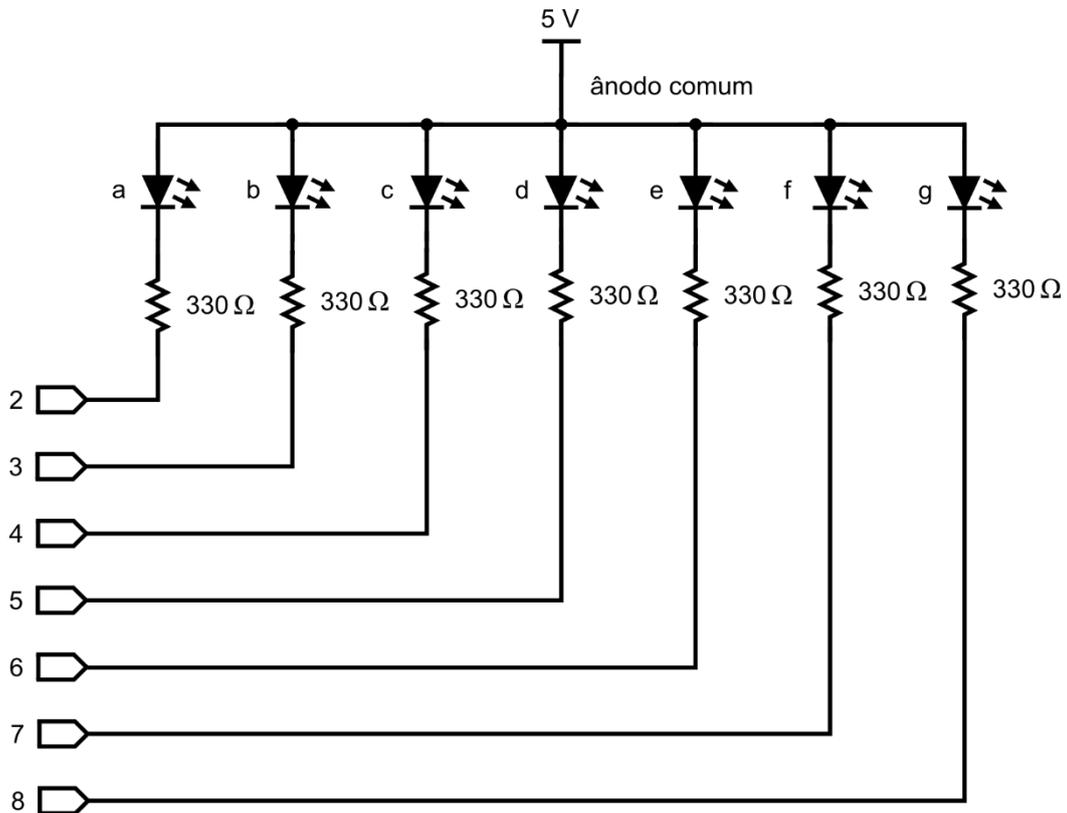
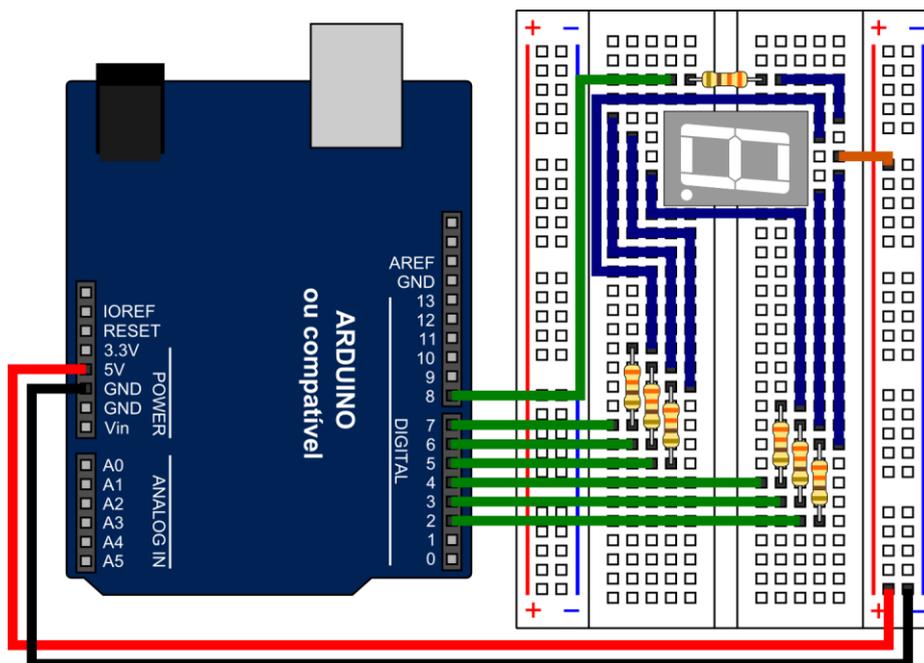


Figura 2.8 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 5.



(a)

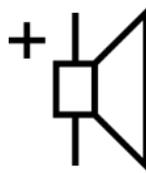


(b)

Figura 2.9 - (a) Imagem de um sonorizador piezo, (b) seu símbolo no esquema dos circuitos e (c) a figura que o representa na ilustração dos circuitos montados.



(a)

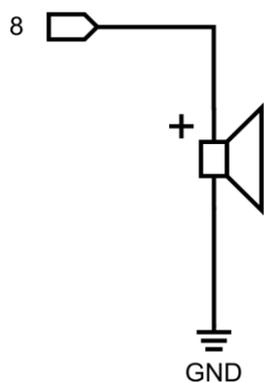


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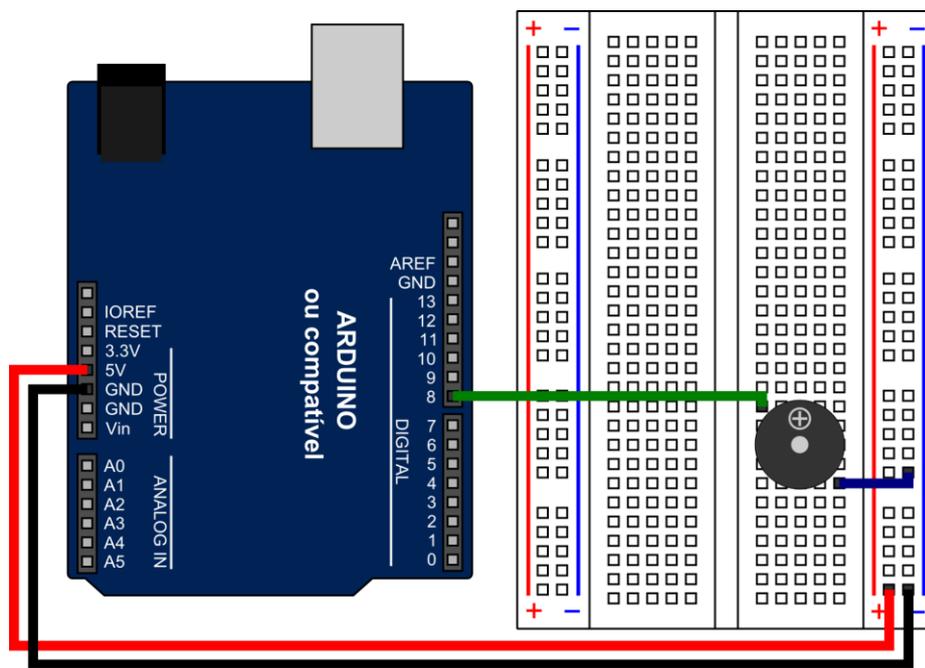


(c)

Figura 2.10 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 7.



(a)

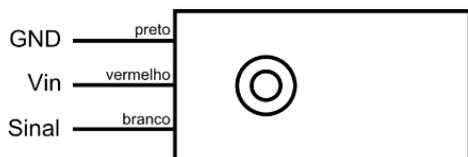


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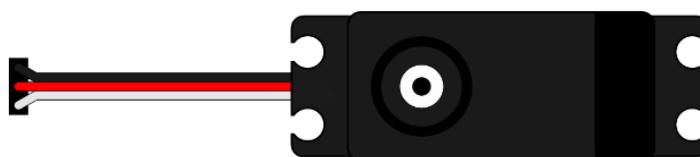
Figura 3.1 - (a) Imagem de um servomotor, (b) seu símbolo no esquema dos circuitos e (c) a figura que o representa na ilustração dos circuitos montados.



(a)



(b)



(c)

Figura 3.2 - Ligação entre a placa e a protoboard.

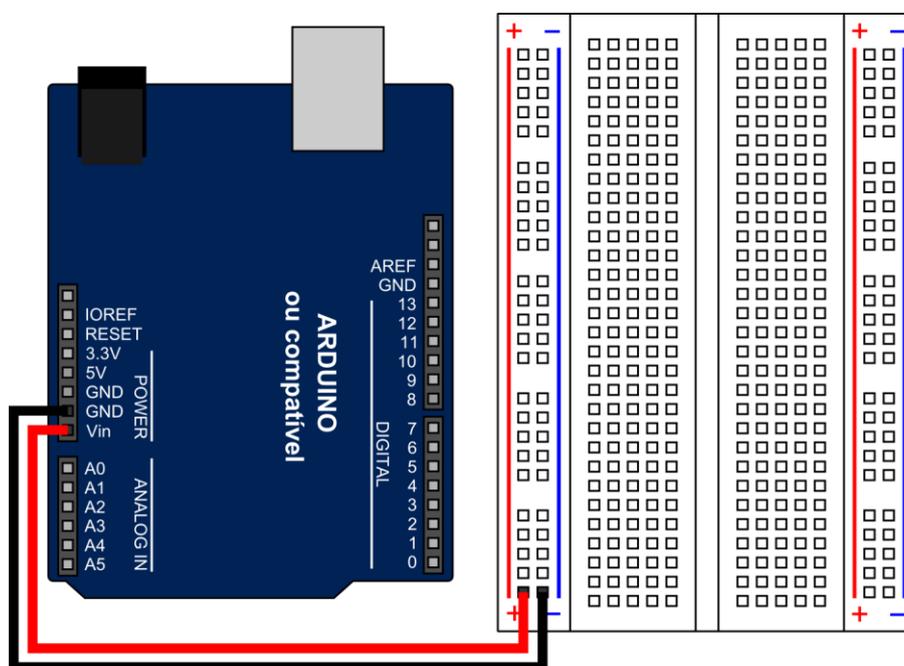


Figura 3.3 - (a) Esquema e (b) ilustração do circuito de ligação de um servo.

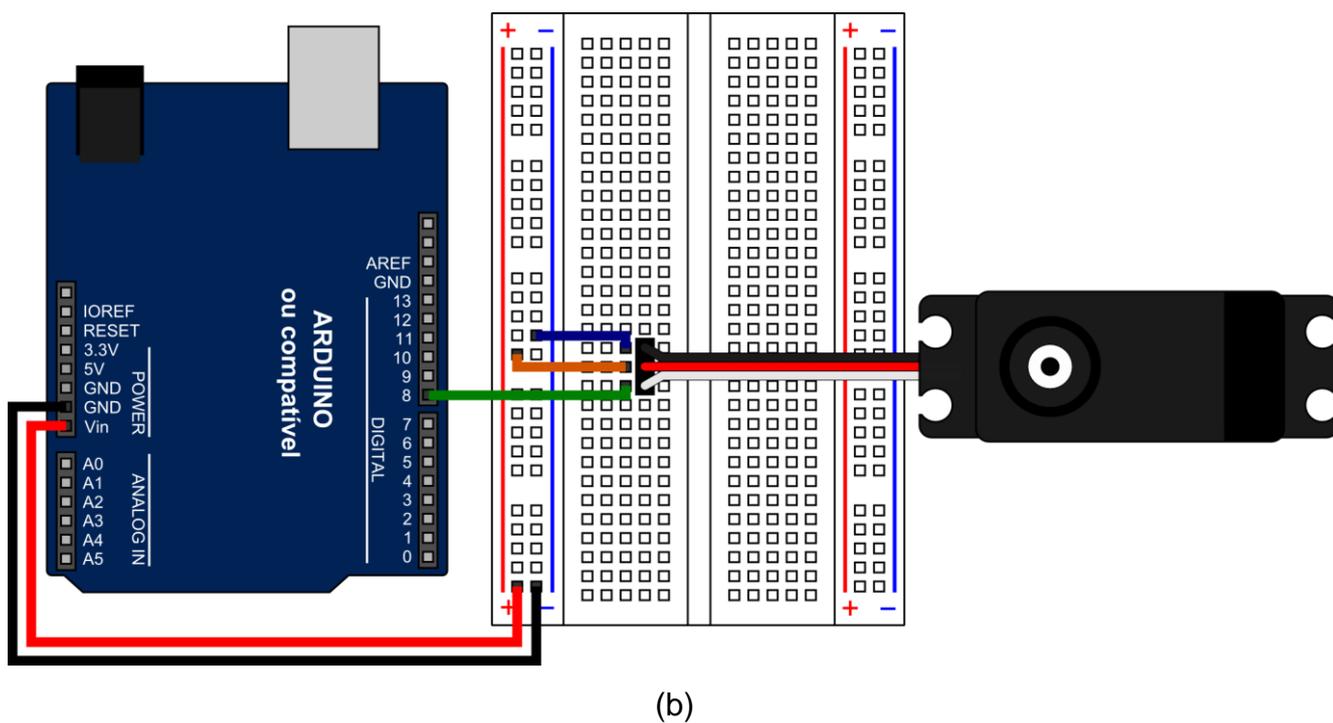
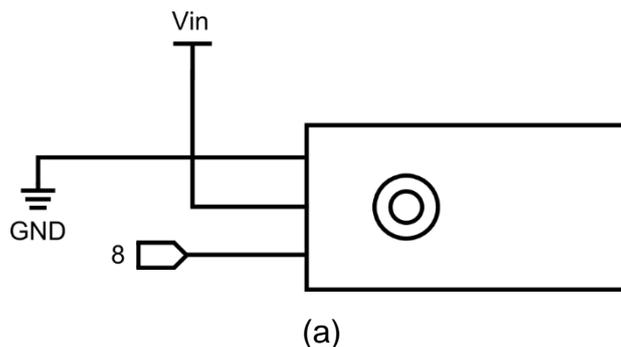


Figura 3.4 - Usando a barra de pinos para conectar um servo na protoboard.

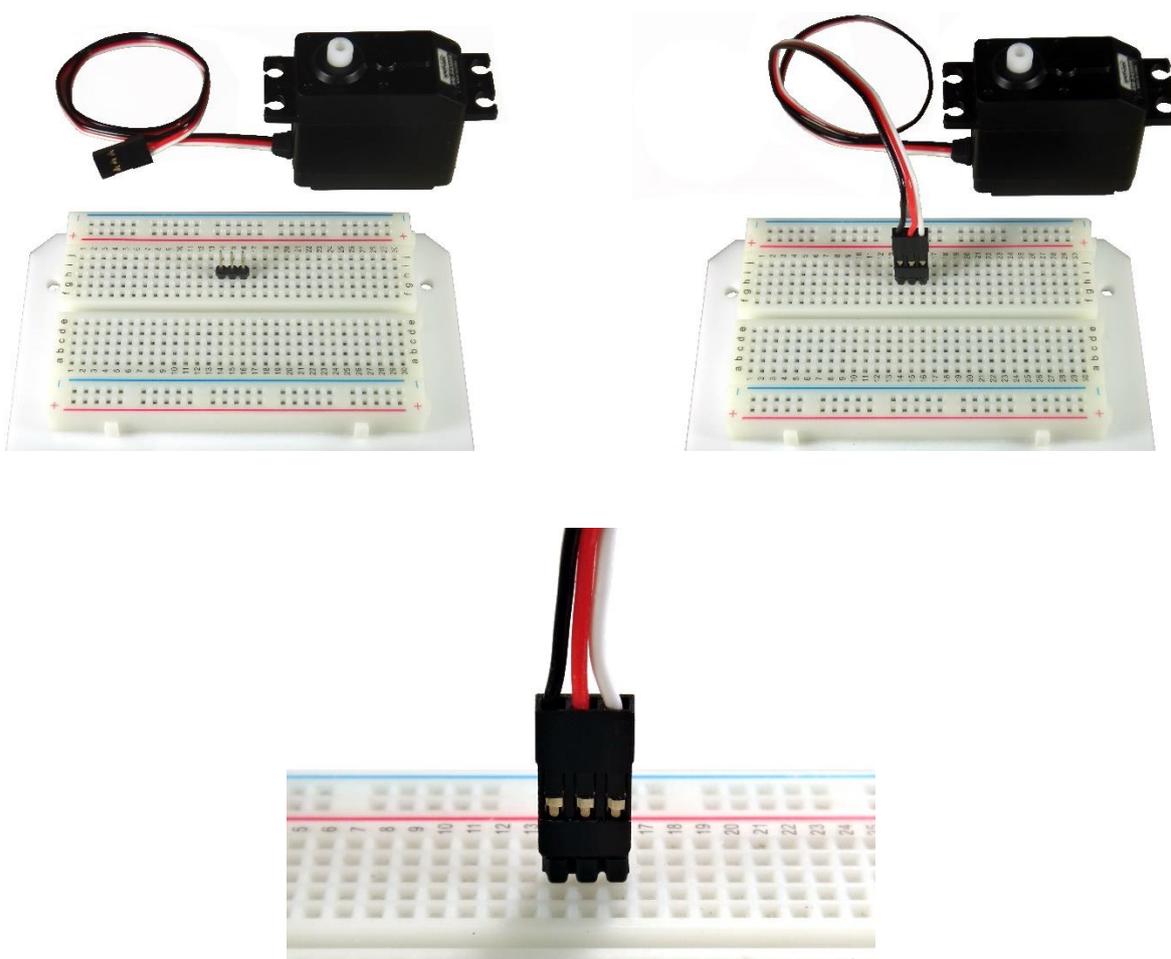


Figura 3.5 - Pulsos com larguras diferentes e os movimentos que eles provocam.

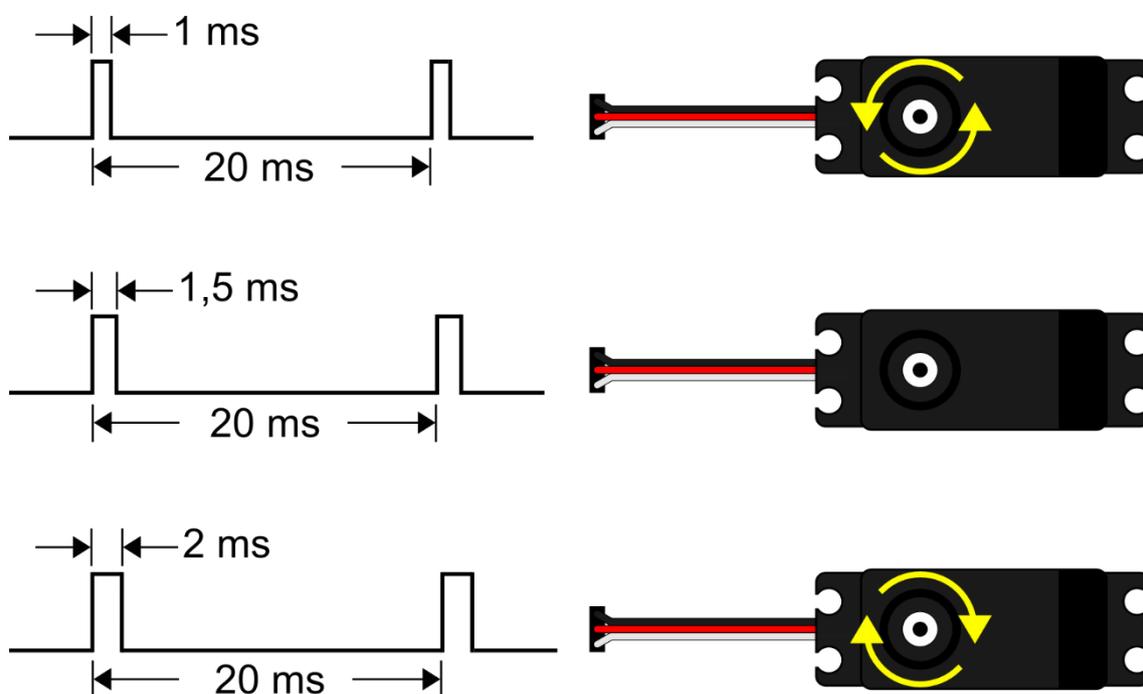


Figura 3.6 - Calibrando um servomotor.

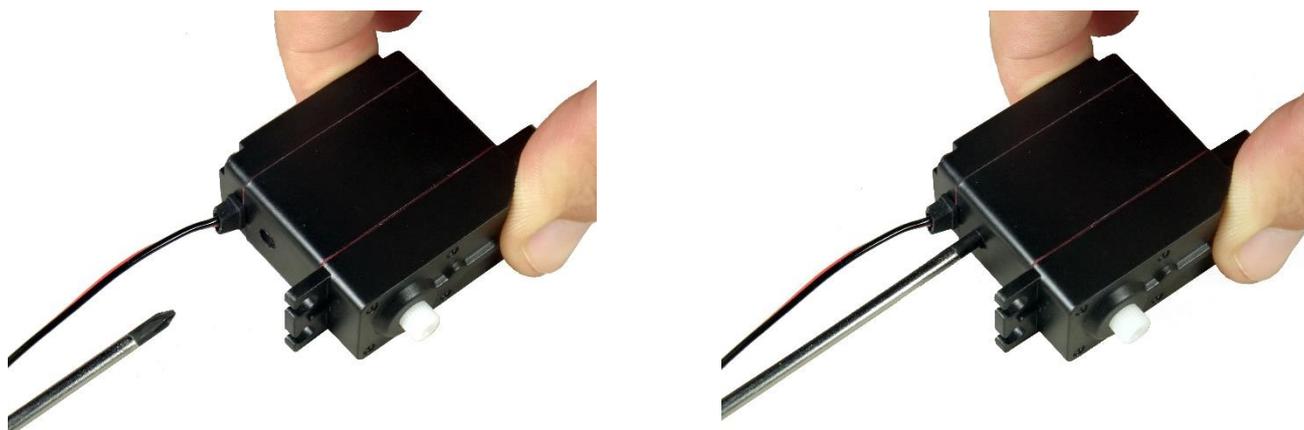
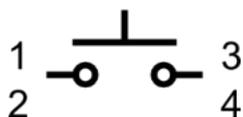


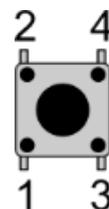
Figura 4.1 - (a) Imagem de uma chave táctil, (b) seu símbolo no esquema dos circuitos e (c) a figura que a representa na ilustração dos circuitos montados.



(a)

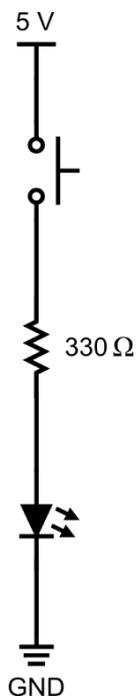


(b)

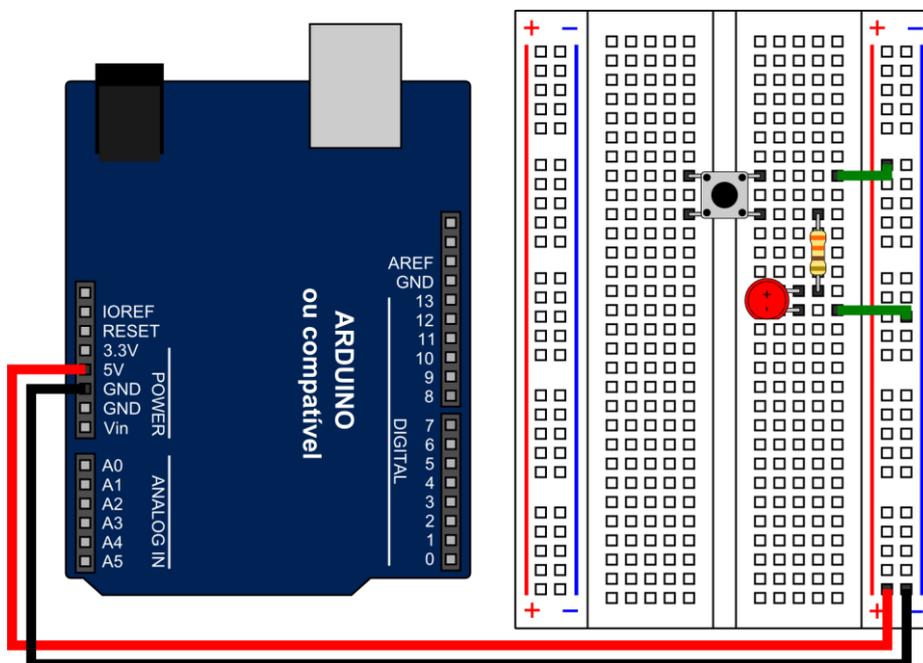


(c)

Figura 4.2 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 11.



(a)



(b)

Figura 4.3 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 12.

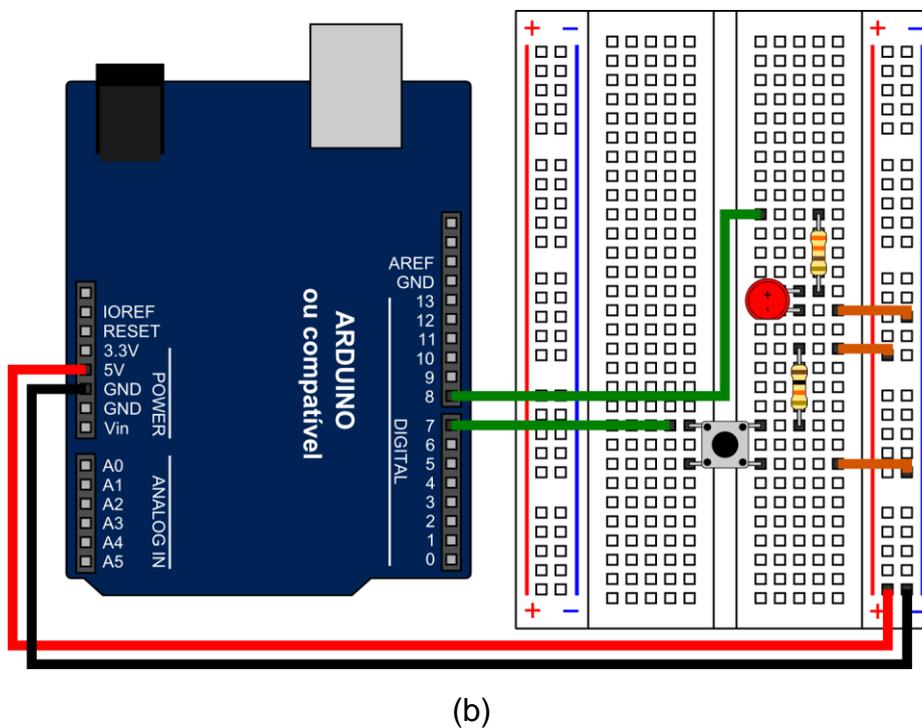
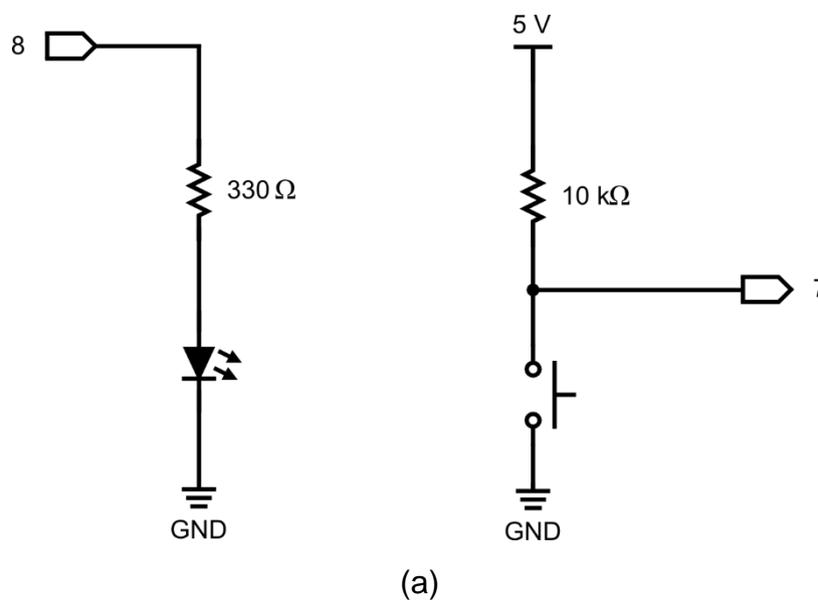
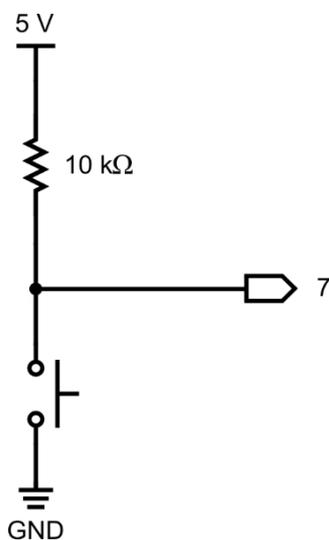
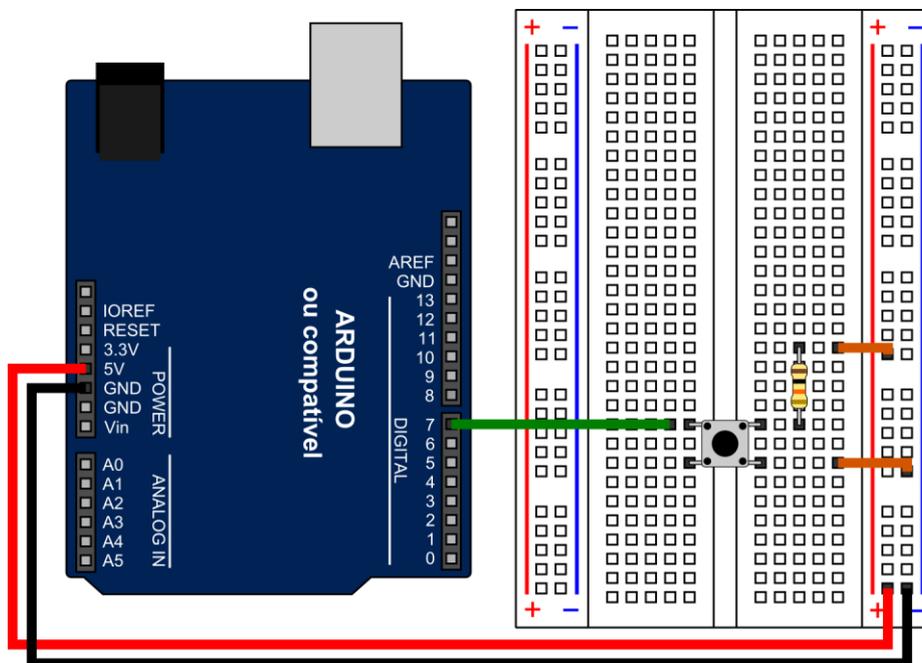


Figura 4.4 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 13.



(a)



(b)

Figura 4.5 - (a) Imagem de uma micro chave, (b) seu símbolo no esquema dos circuitos e (c) a figura que a representa na ilustração dos circuitos montados.

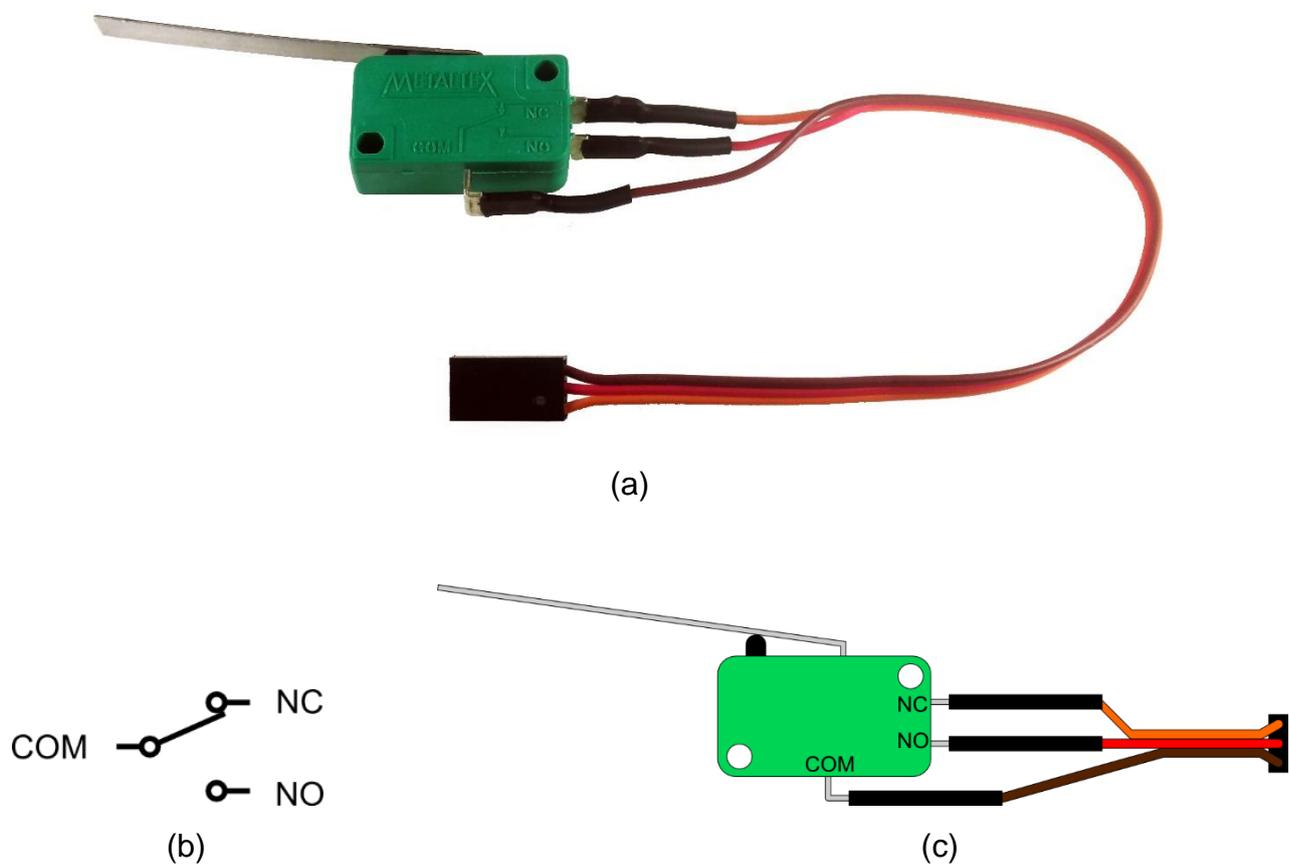


Figura 4.6 - Usando uma barra de pinos para conectar uma micro chave na protoboard.

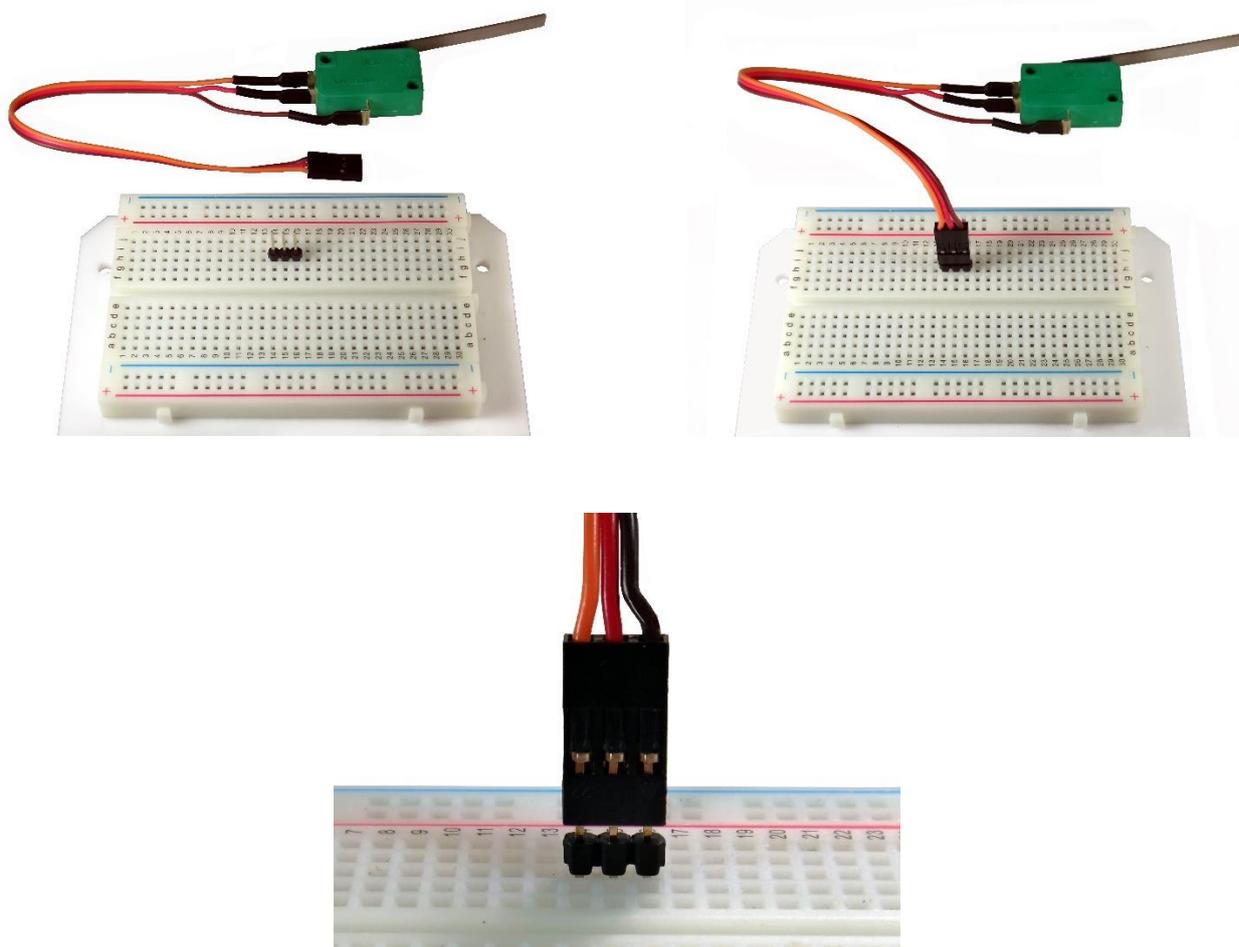
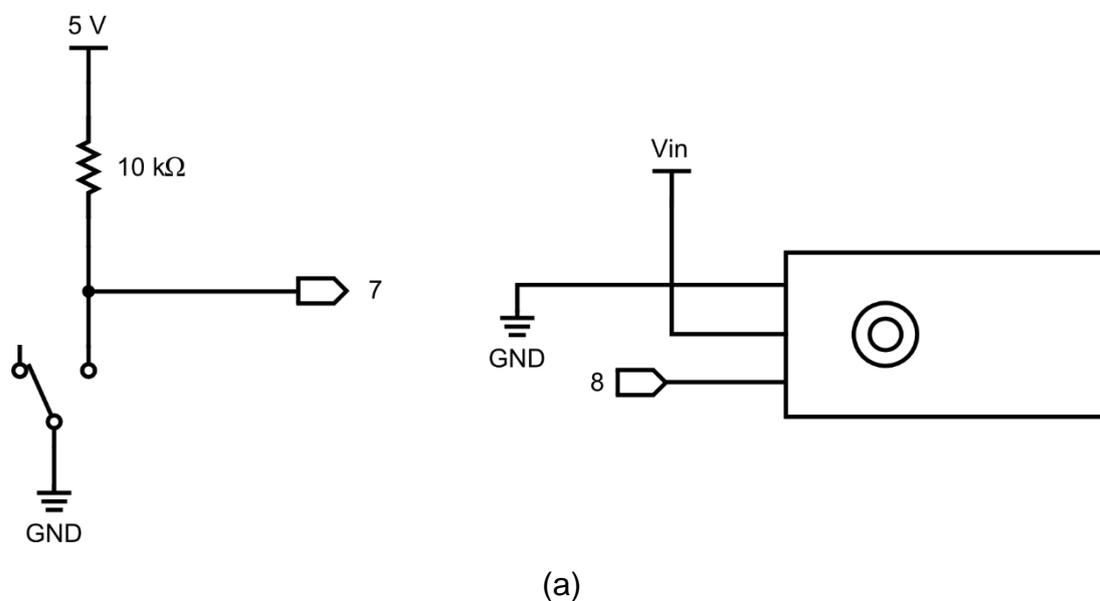
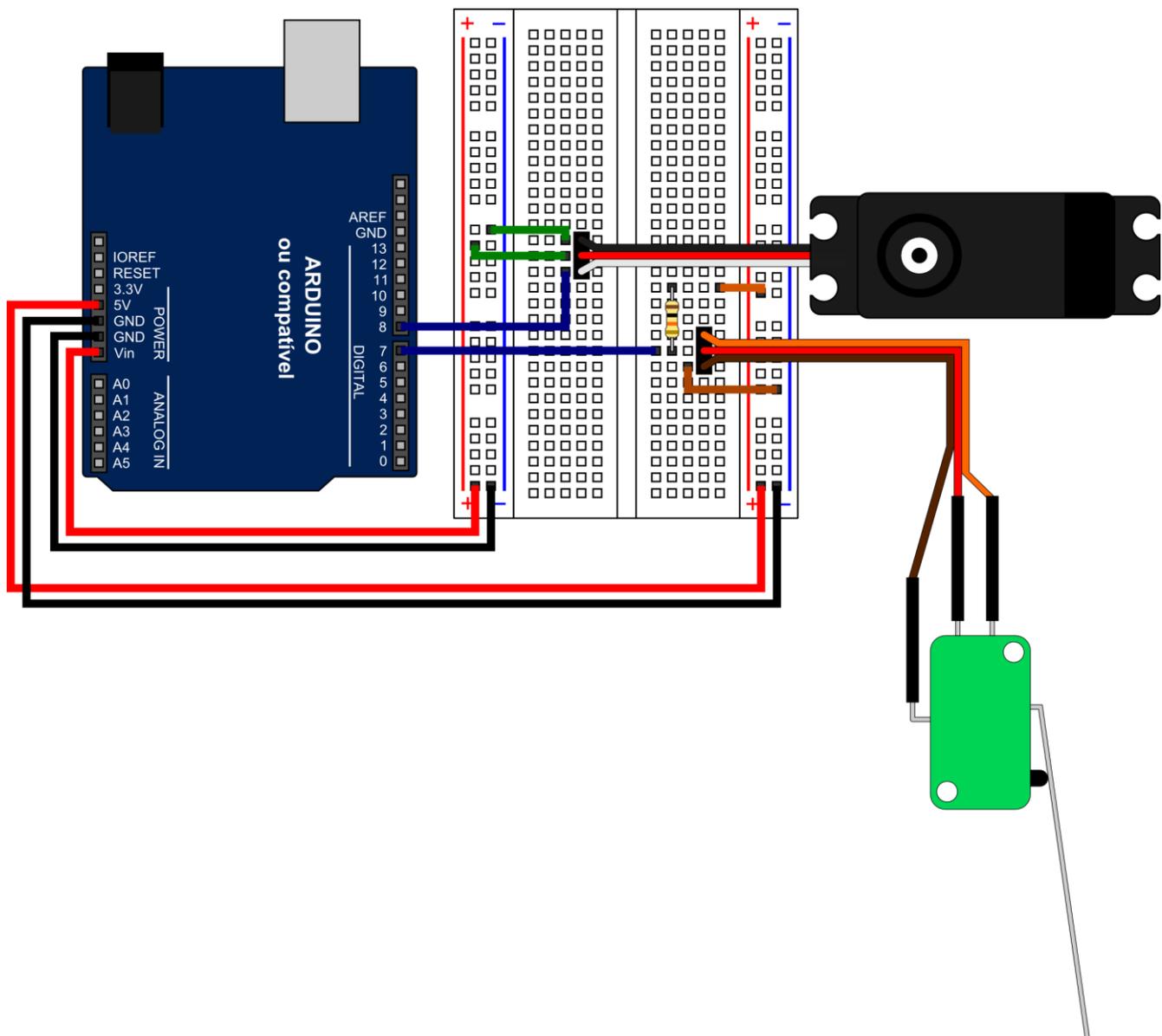


Figura 4.7 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 14.



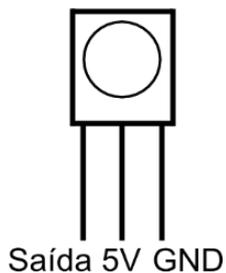


(b)

Figura 4.8 - (a) Imagem de um receptor de infravermelho, (b) seu símbolo no esquema dos circuitos e (c) a figura que o representa na ilustração dos circuitos montados.



(a)



(b)



(c)

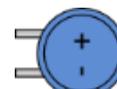
Figura 4.9 - (a) Imagem de um LED infravermelho, (b) seu símbolo no esquema dos circuitos e (c) a figura que o representa na ilustração dos circuitos montados.



(a)



(b)



(c)

Figura 4.10 - Suporte para LED.



Figura 4.11 - Montagem do LED infravermelho dentro do suporte para LED.

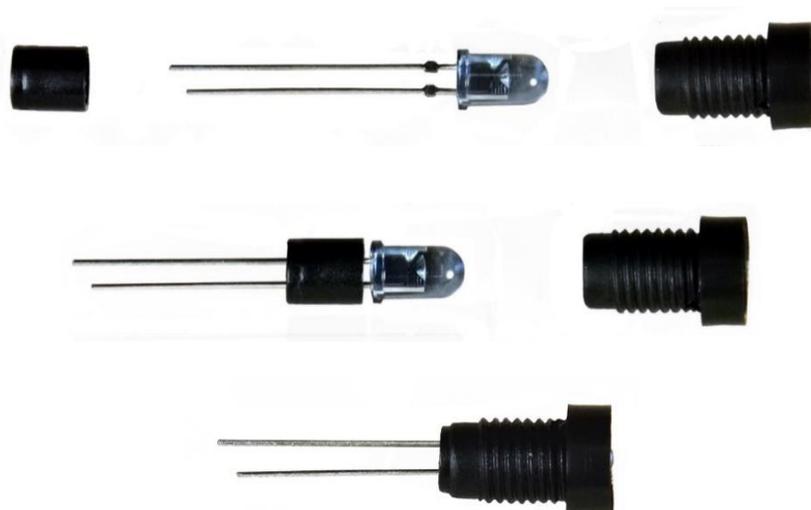


Figura 4.12 - Usando uma barra de pinos para conectar um cabo extensor na protoboard.

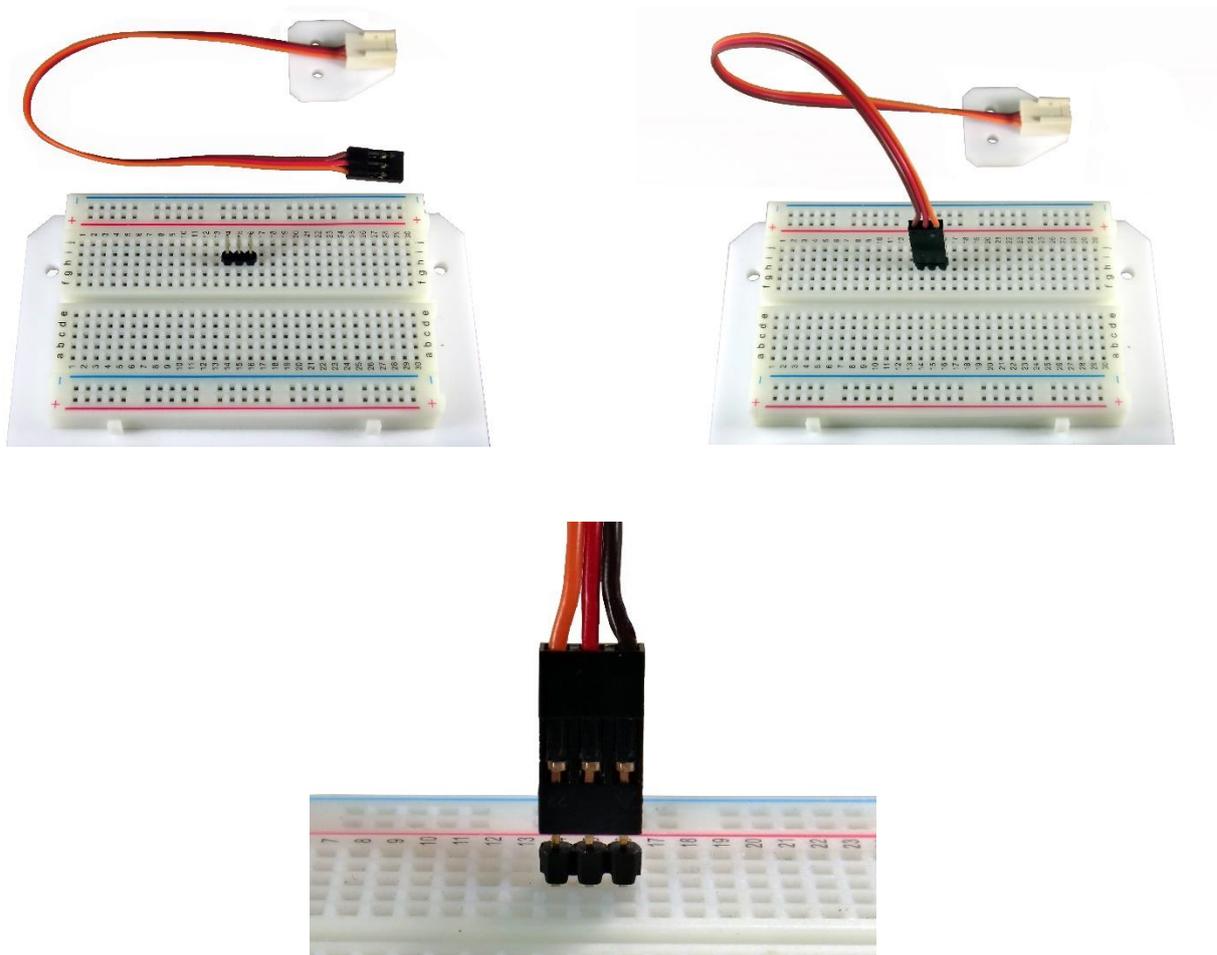


Figura 4.13 - Conectando um receptor de infravermelho em um cabo extensor.



Figura 4.14 - Diferentes formas de prender um cabo extensor no chassi.

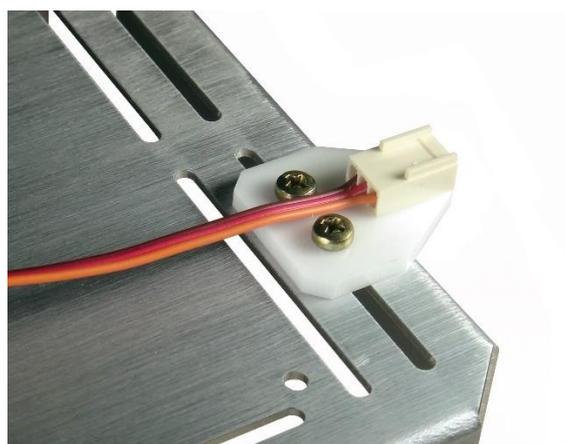


Figura 4.15 - Diferentes maneiras de fixar os suportes no chassi.

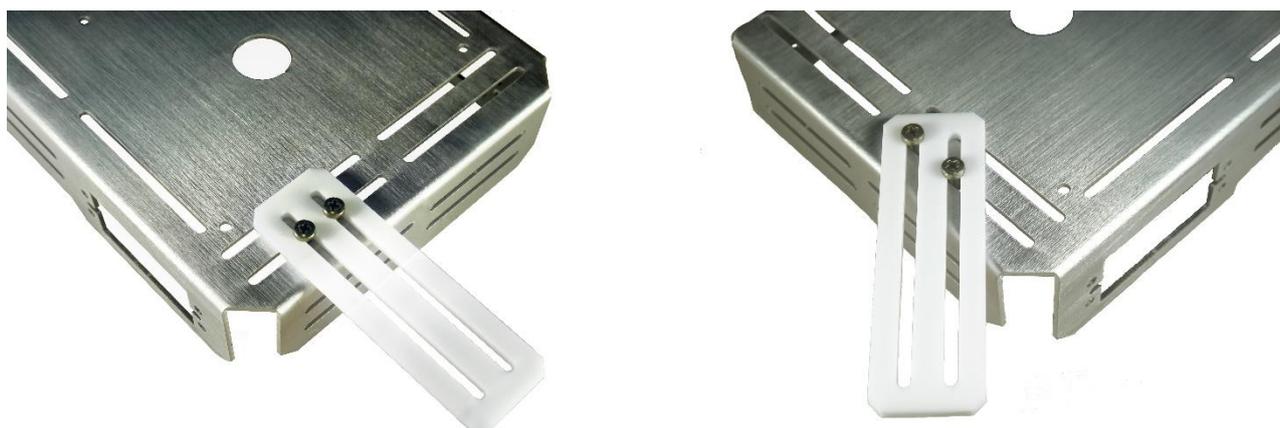


Figura 4.16 - Diferentes maneiras de fixar os cabos extensores nos suportes.



Figura 4.17 - Prendendo os cabos extensores no suporte.

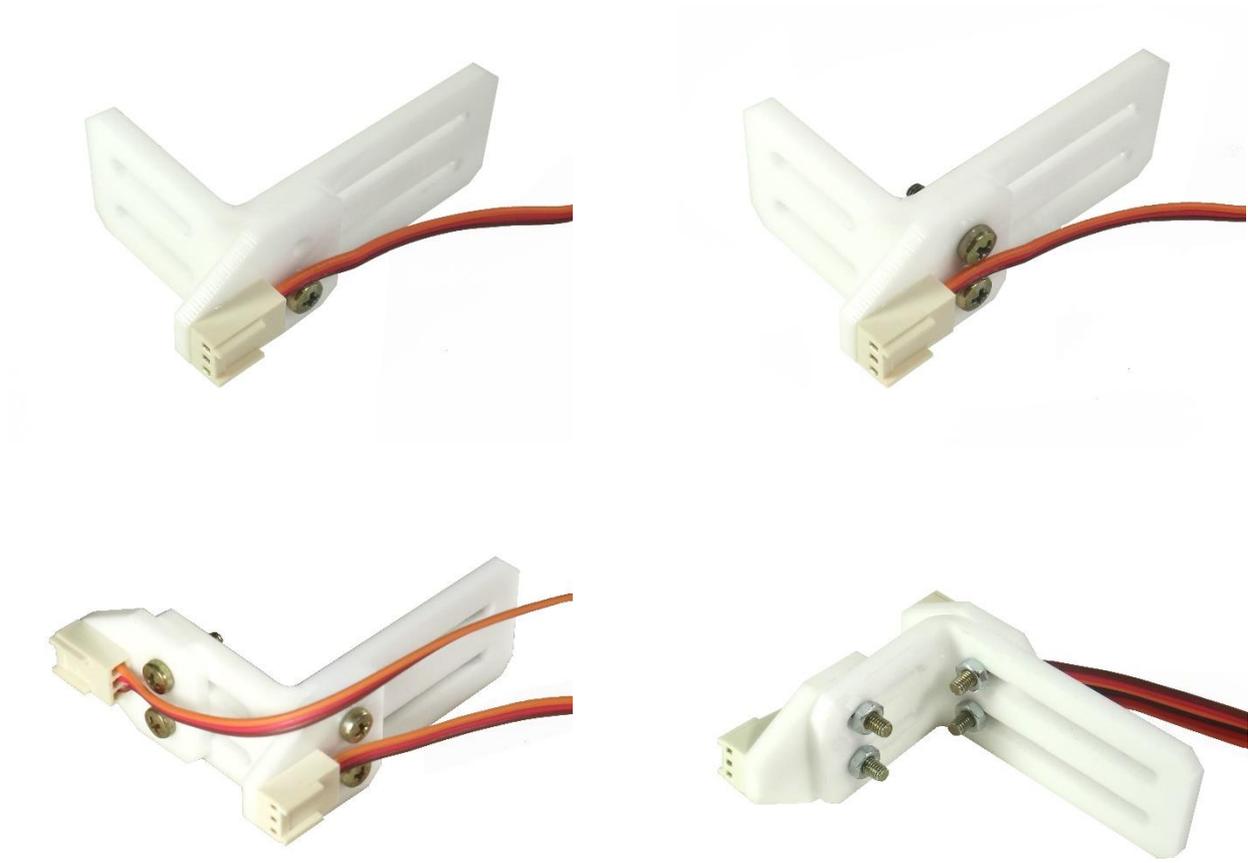


Figura 4.18 - Montando o LED infravermelho dentro do suporte para LED.

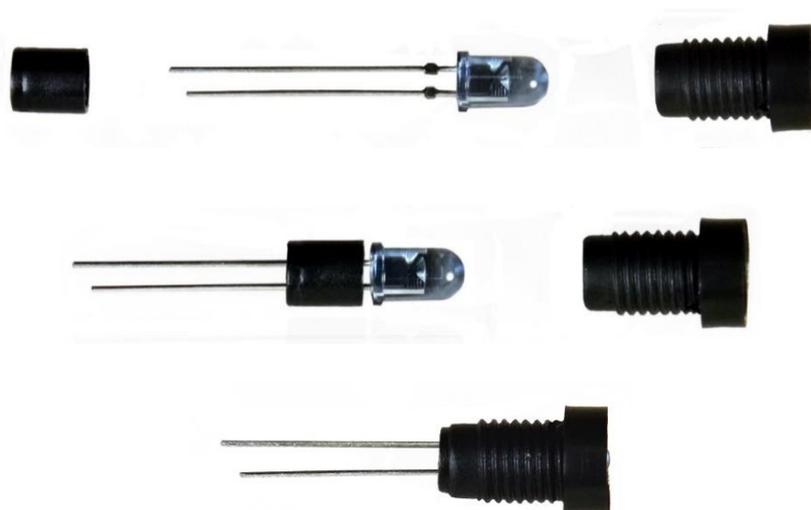


Figura 4.19 - Conectando o LED infravermelho no cabo extensor.



Figura 4.20 - Conectando o receptor de infravermelho no cabo extensor.



Figura 4.21 - Ligando os cabos extensores na protoboard.

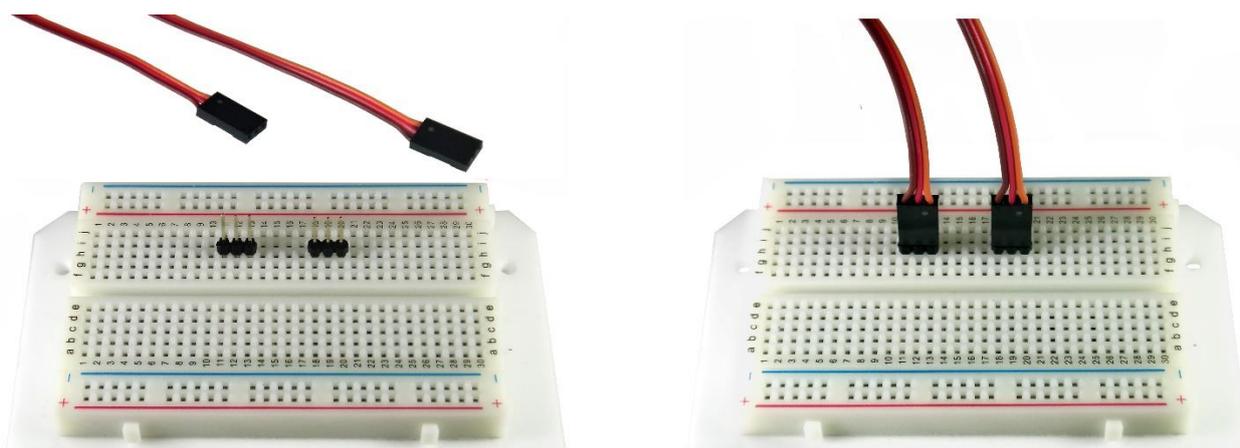


Figura 4.22 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 15.

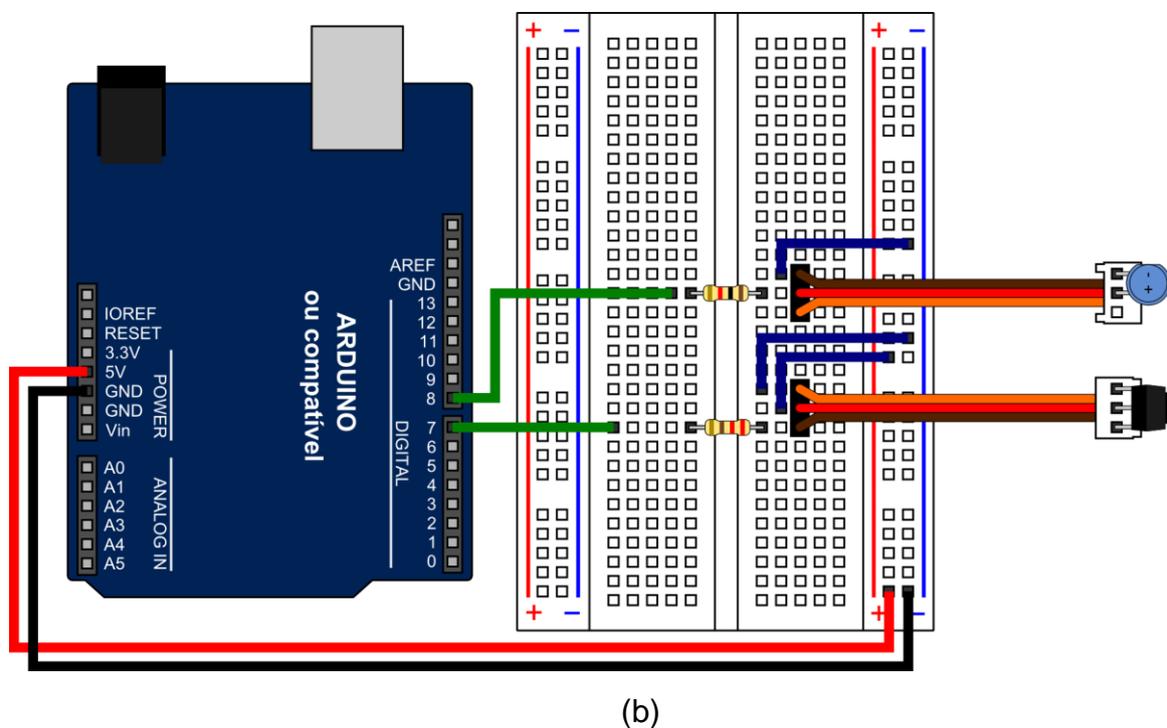
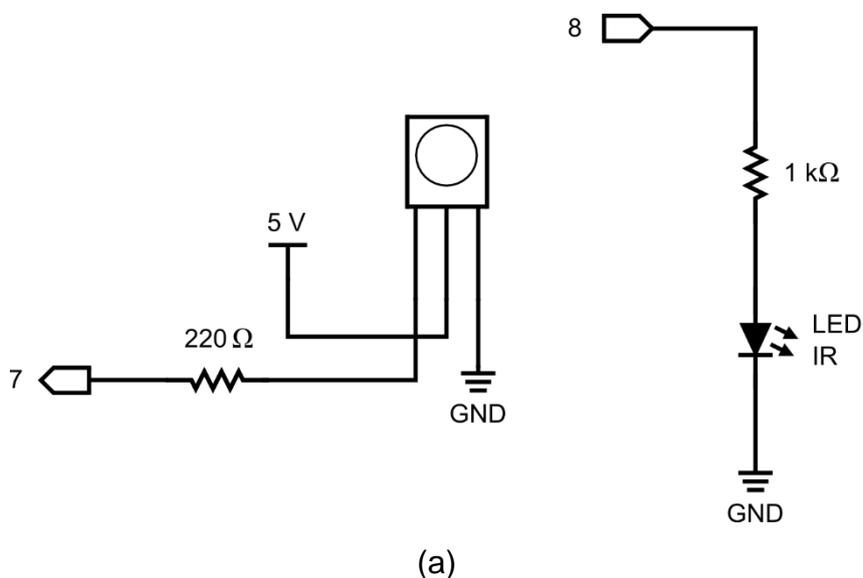


Figura 4.23 - Emissão e reflexão (a) com e (b) sem obstáculo.

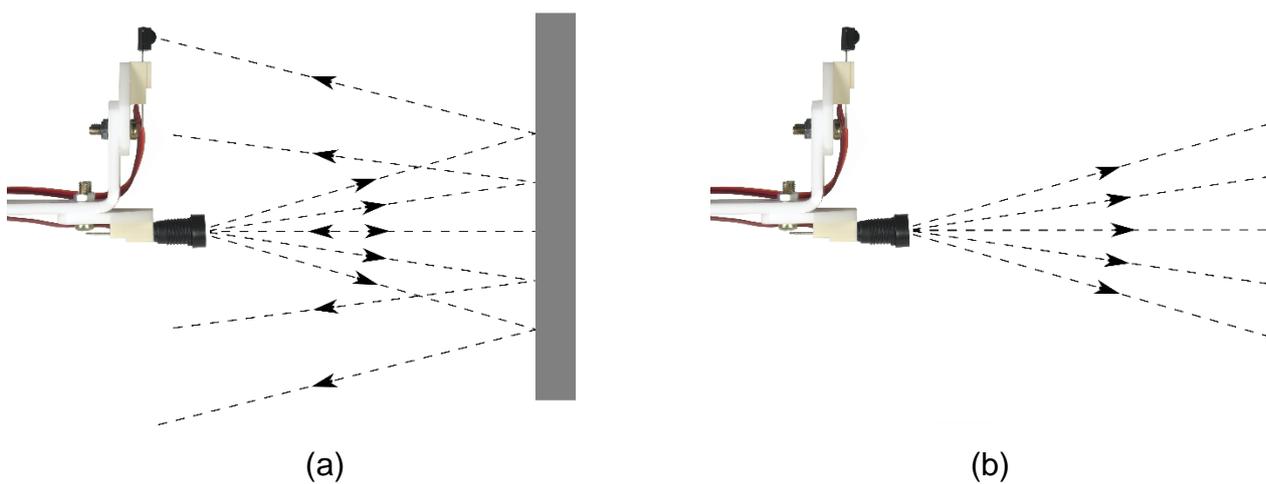


Figura 4.24 - Identificação de regiões de detecção.

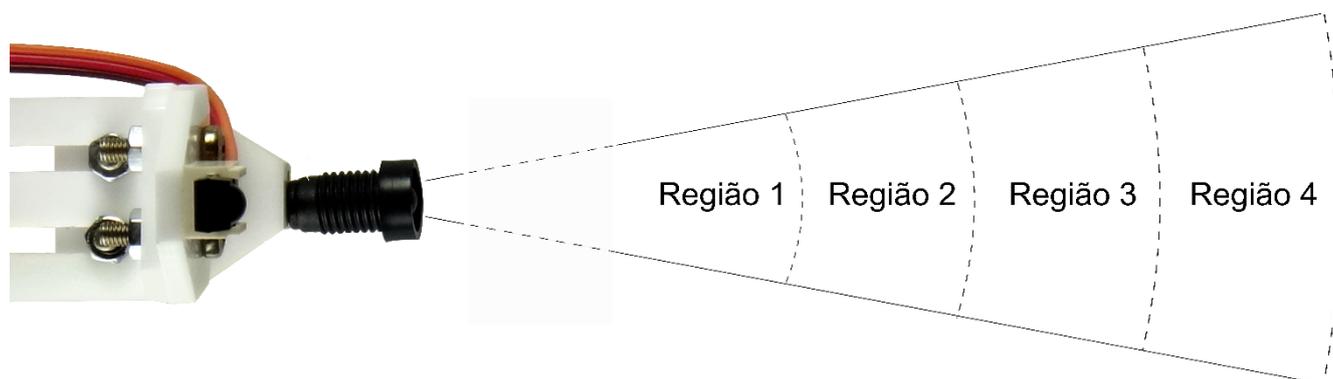
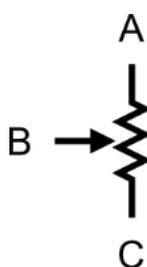


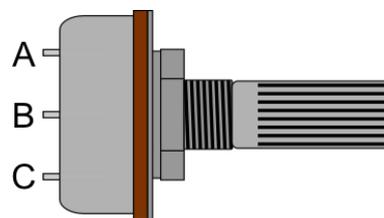
Figura 5.1 - (a) Imagem de um potenciômetro, (b) seu símbolo no esquema dos circuitos e (c) a figura que o representa na ilustração dos circuitos montados.



(a)

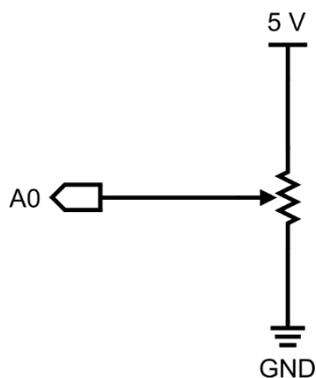


(b)

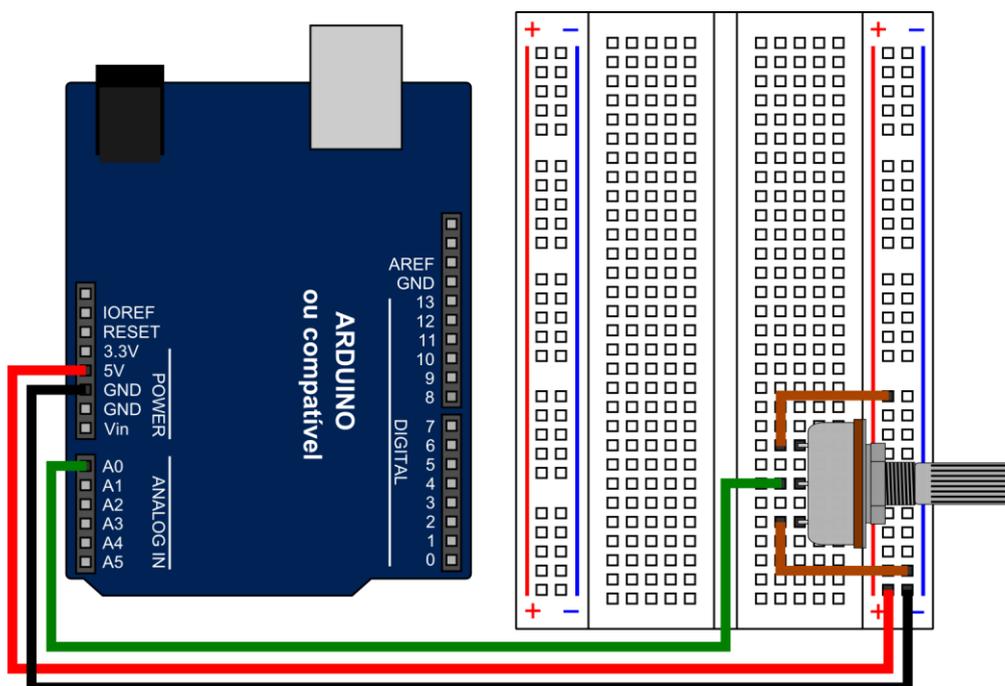


(c)

Figura 5.2 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 17.

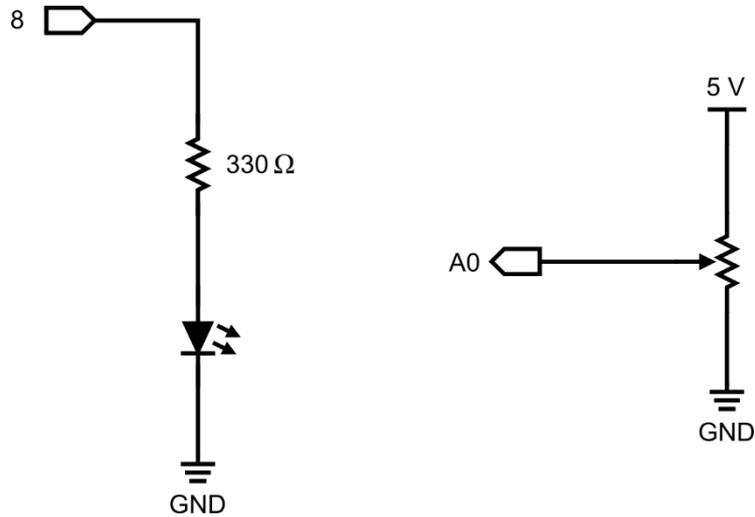


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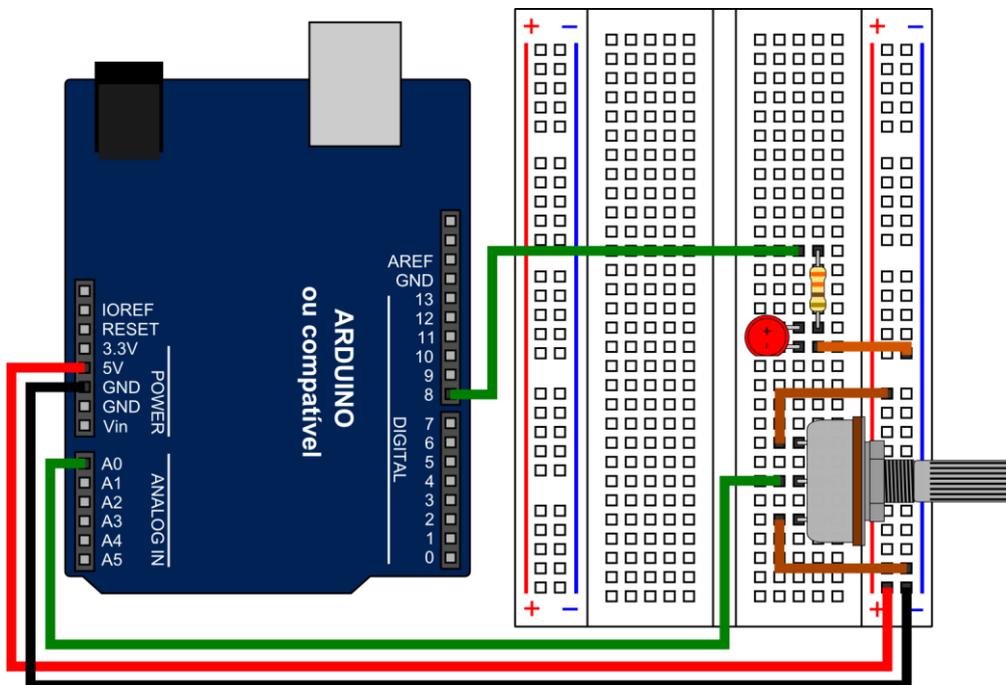


(b)

Figura 5.3 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 19.

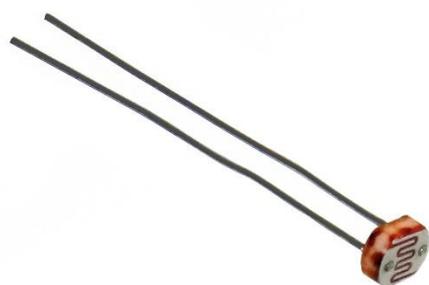


(a)



(b)

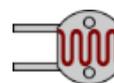
Figura 5.4 - (a) Imagem de um foto resistor, (b) seu símbolo no esquema dos circuitos e (c) a figura que o representa na ilustração dos circuitos montados.



(a)

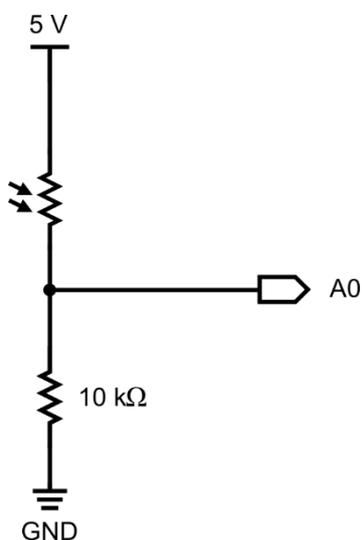


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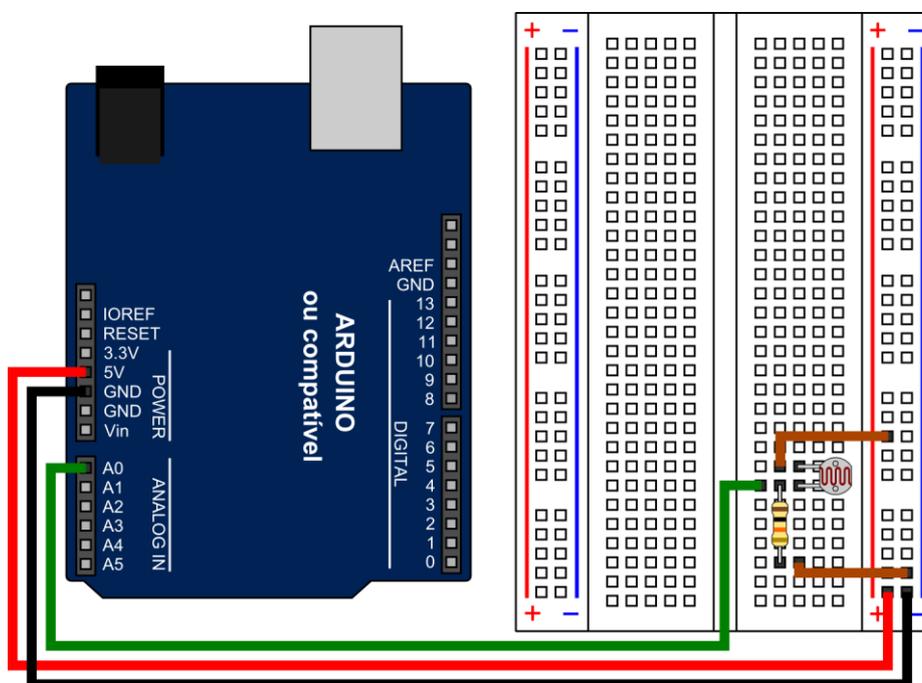


(c)

Figura 5.5 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 20.



(a)



(b)

Figura 6.1 - Chassi.



Figura 6.2 - Prendendo os espaçadores no chassi.



Figura 6.3 - Prendendo o suporte de pilhas no chassi.

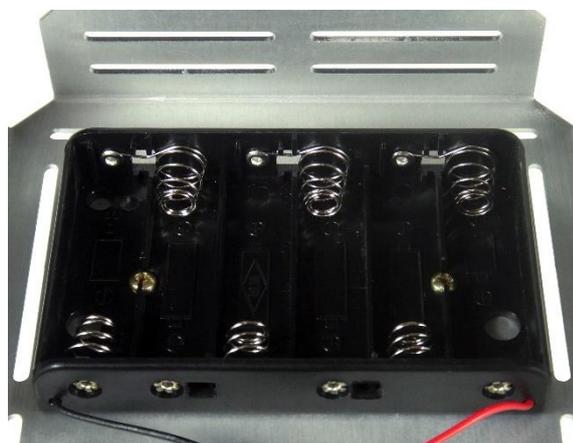


Figura 6.4 - Passando o conector do suporte de pilhas pelo furo do chassi.



Figura 6.5 - Inserindo o eixo no furo da esfera.



Figura 6.6 - Inserindo parafusos com arruelas na parte traseira do chassi.

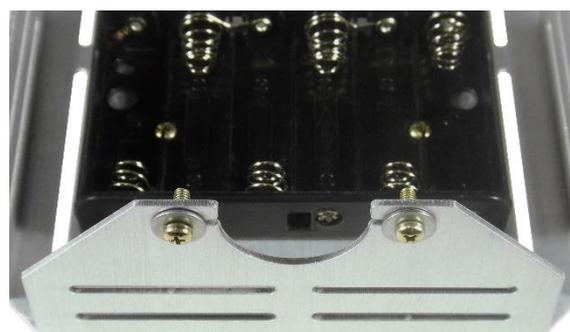


Figura 6.7 - Encaixando a esfera com eixo na parte traseira do chassi.



Figura 6.8 - Prendendo o eixo da esfera.



Figura 6.9 - Verificando se a esfera gira livremente.

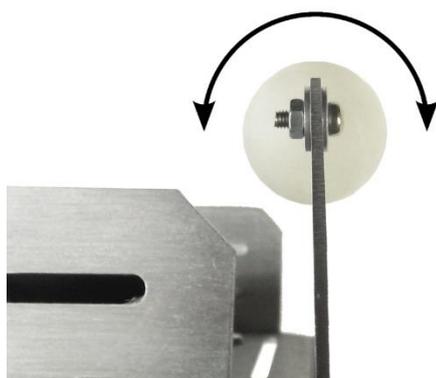


Figura 6.10 - Prendendo os servos no chassi.

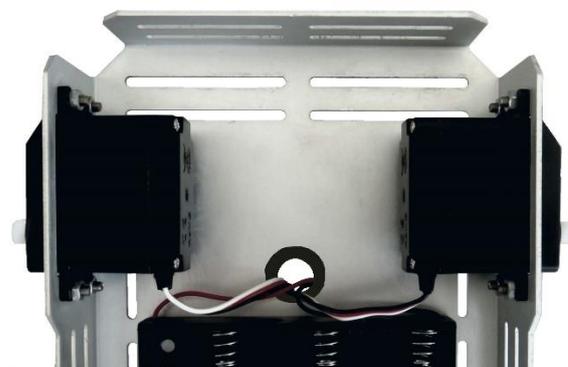


Figura 6.11 - Passando os cabos dos servos pelo furo do chassi.

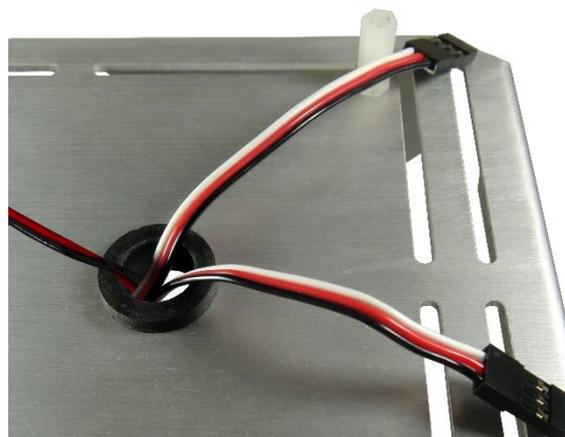
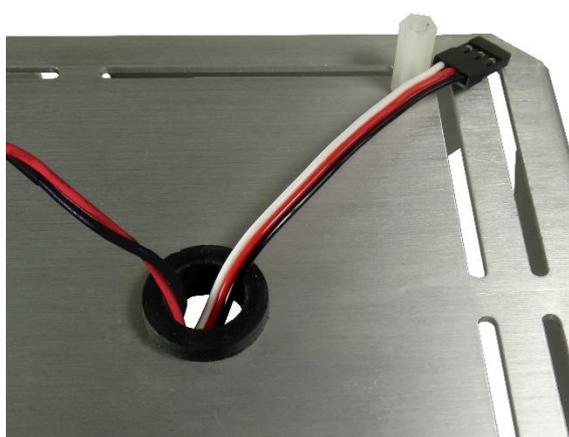
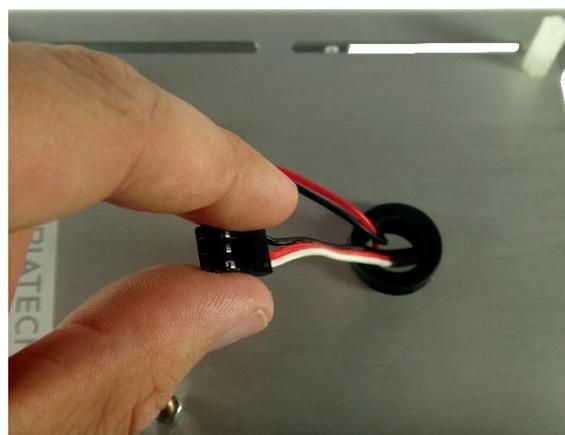
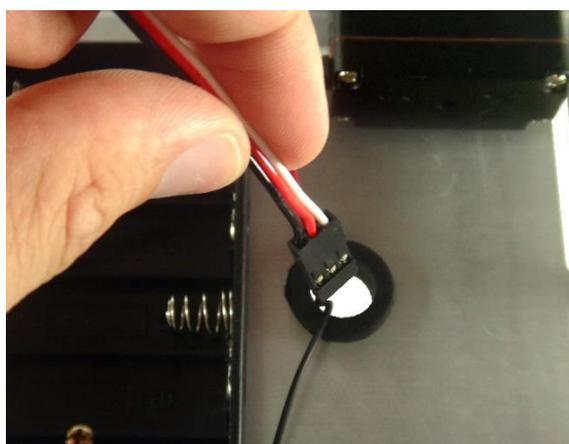


Figura 6.12 - Passando os cabos dos servos pelos furos da base de prototipagem.

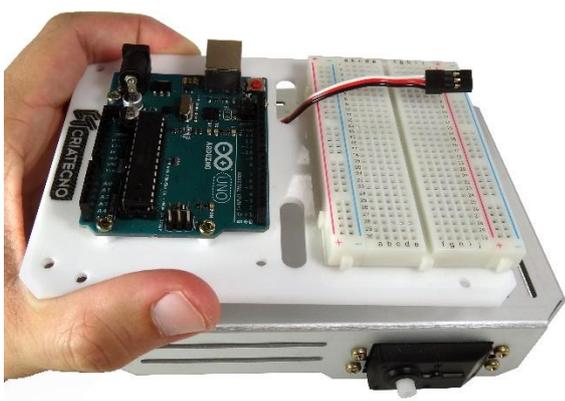
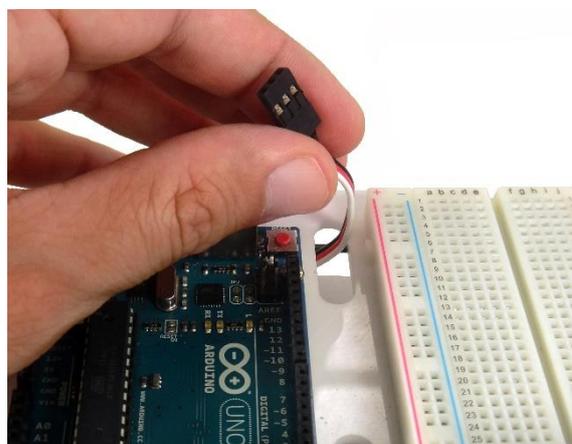


Figura 6.13 - Prendendo a base de prototipagem nos espaçadores.

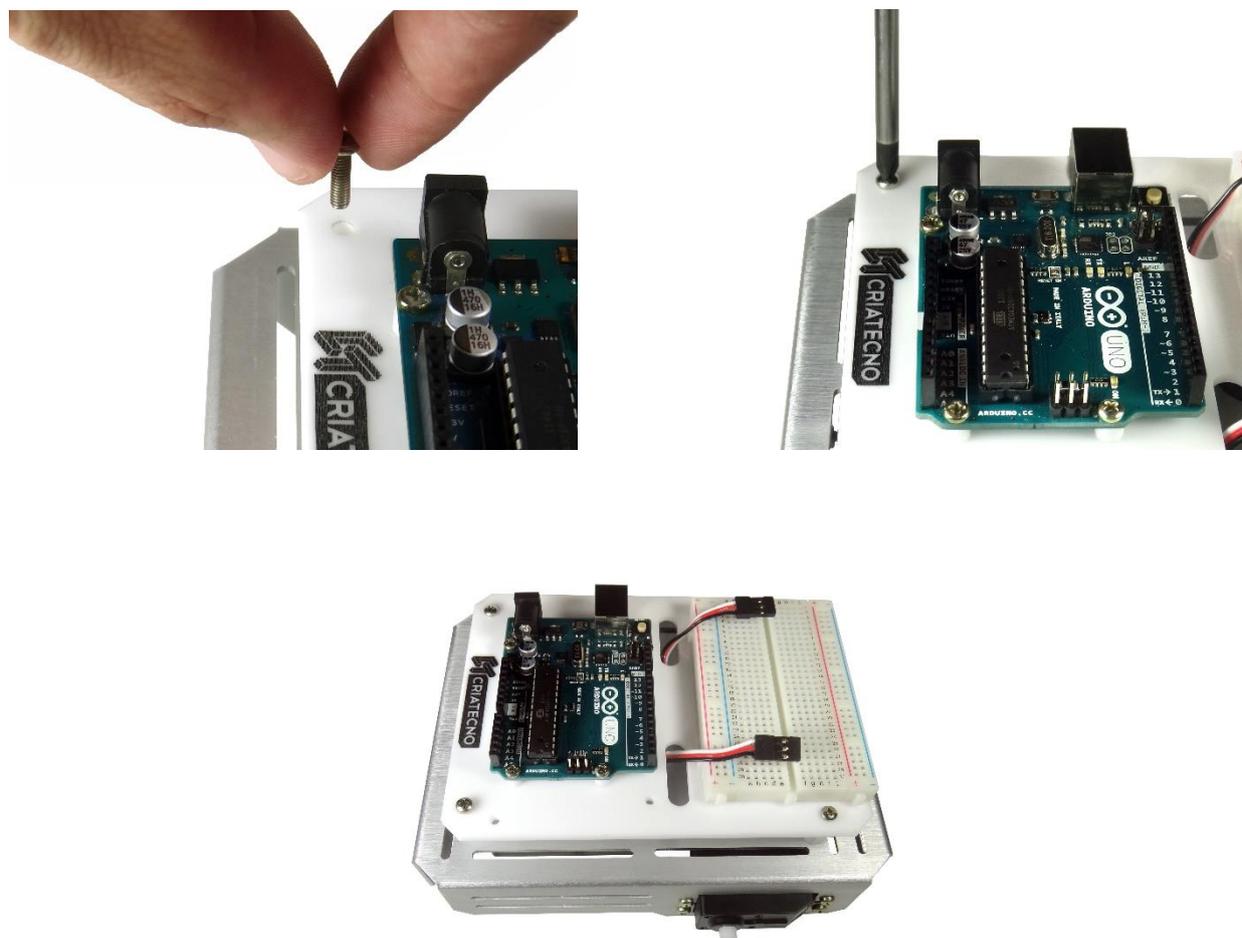


Figura 6.14 - Encaixando os anéis de borracha nas rodas.

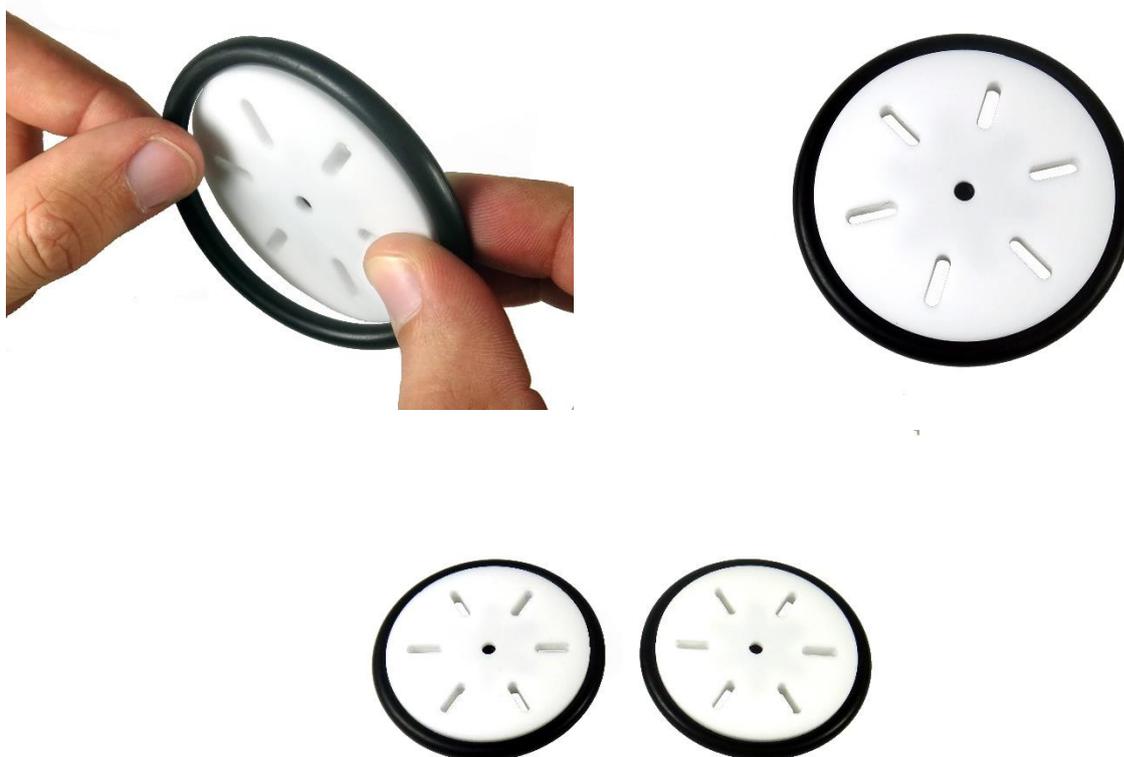


Figura 6.15 - Prendendo as rodas nos servos.

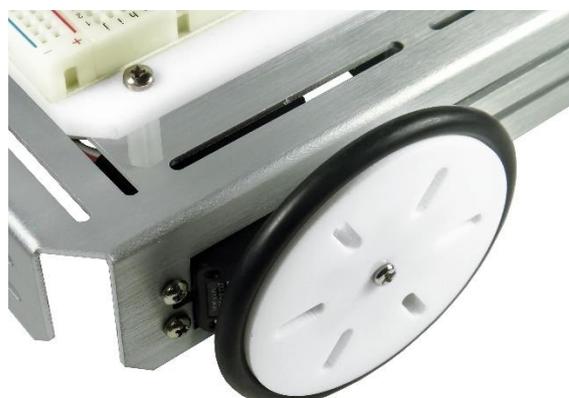
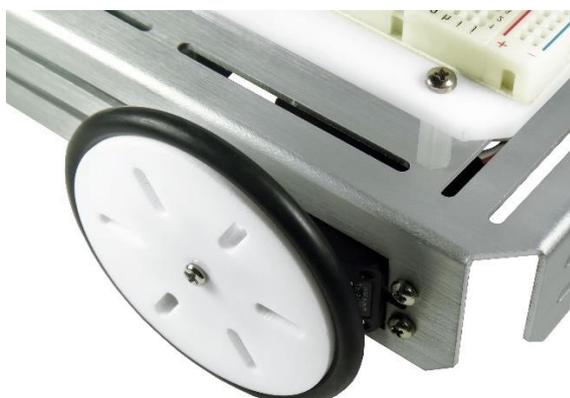
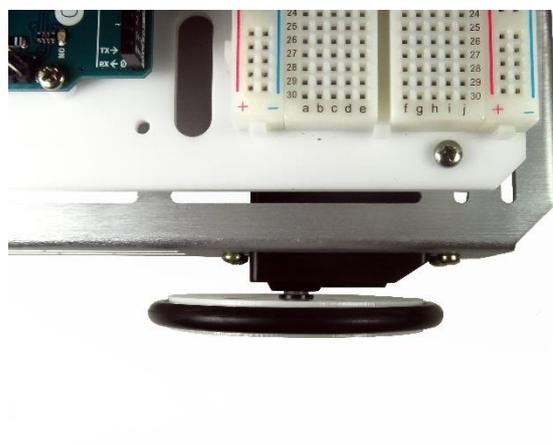


Figura 6.16 - Ligando os conectores dos servos na protoboard.

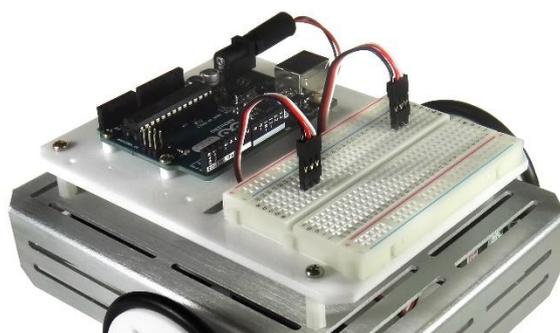


Figura 6.17 - (a) Esquema e (b) ilustração do circuito eletrônico usado para a ligação de servos.

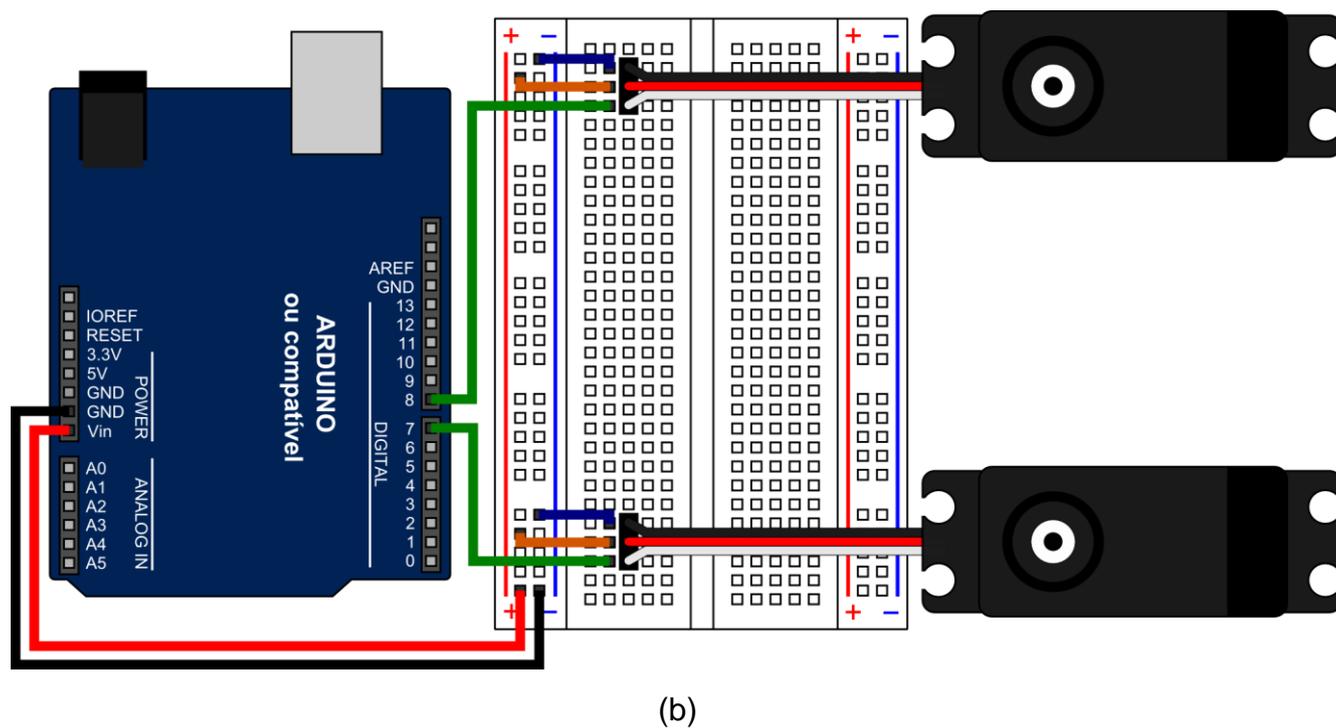
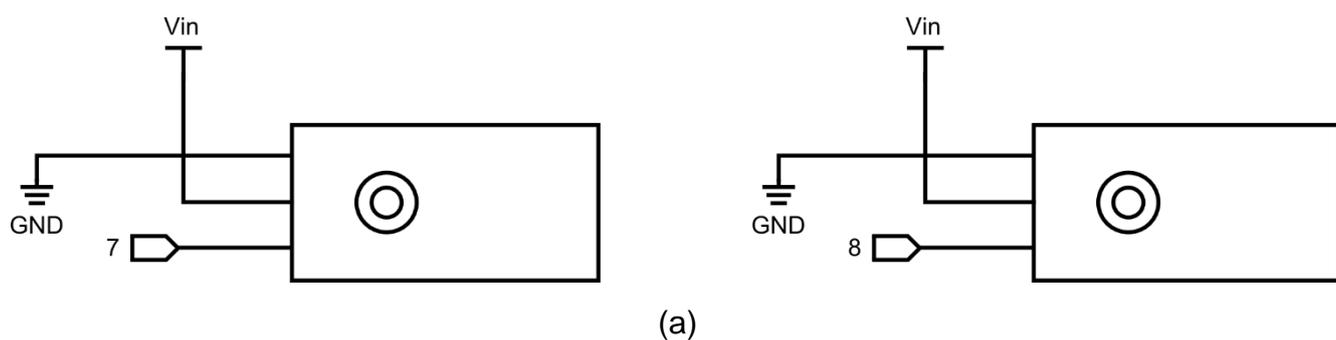


Figura 6.18 - Vista superior do robô.

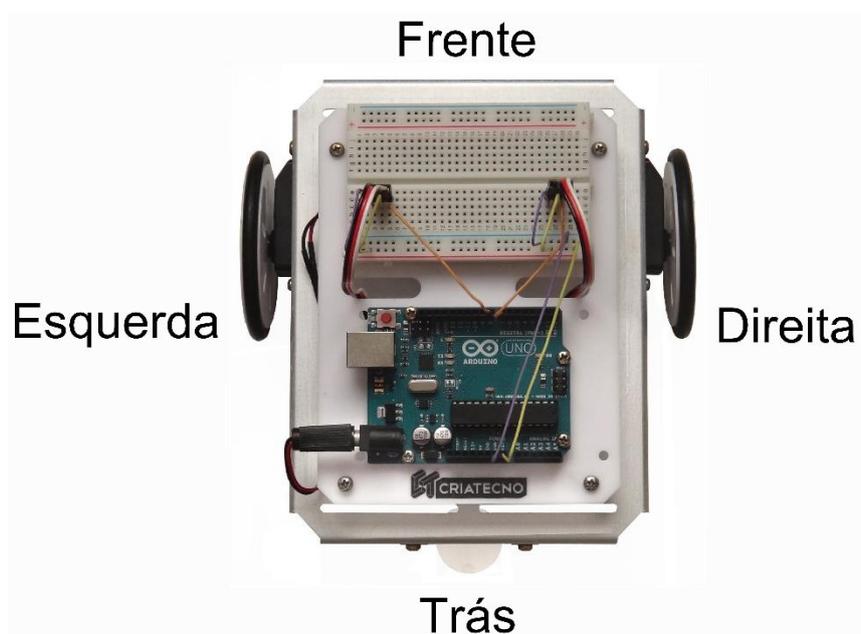


Figura 6.19 - Convenção adotada para o movimento das rodas.



Figura 6.20 - Giro das rodas para que o robô se movimente para frente e para trás.

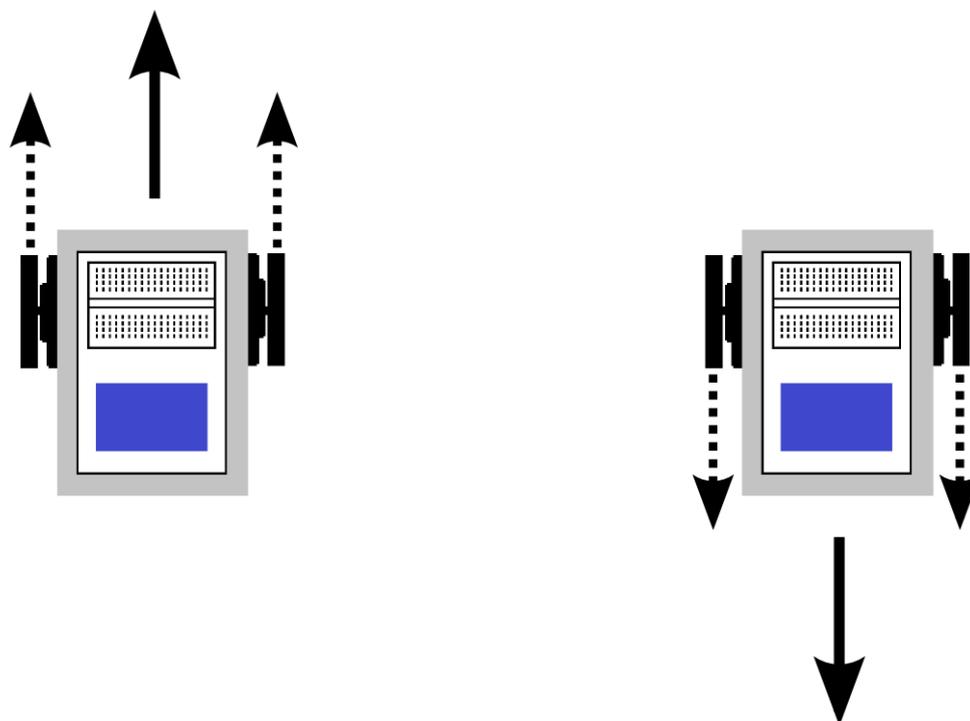


Figura 6.21 - Giro das rodas para que o robô gire para a direita e para a esquerda.

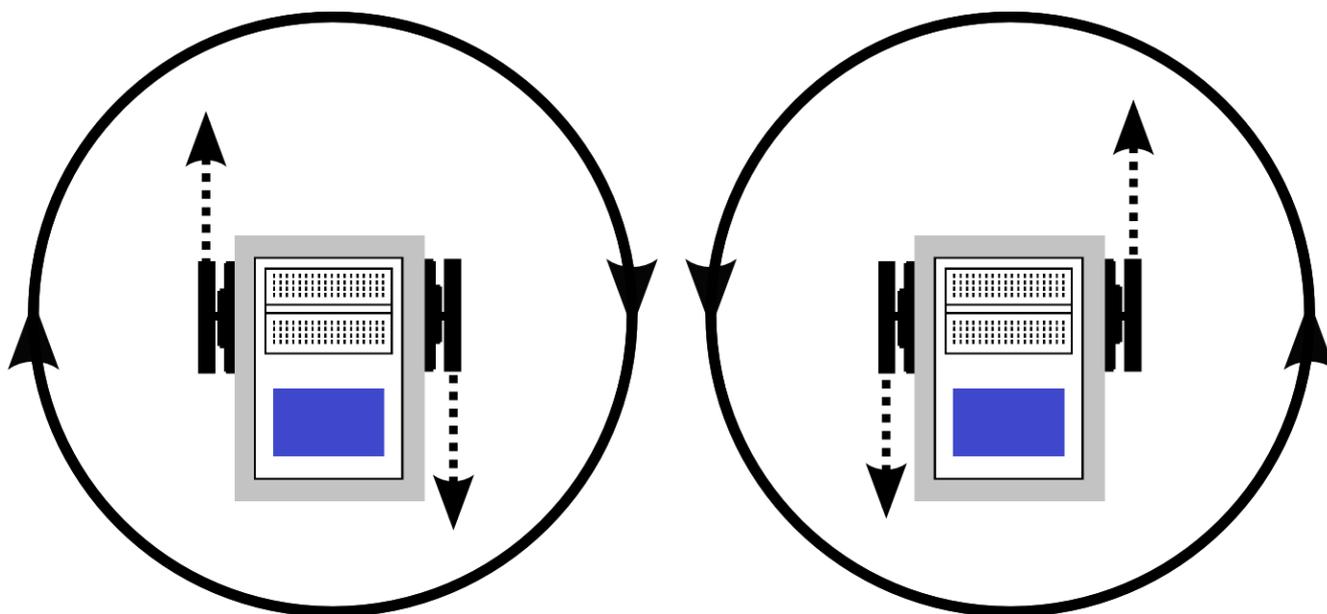


Figura 6.22 - Giro das rodas para que o robô realize curvas para a direita e para a esquerda.

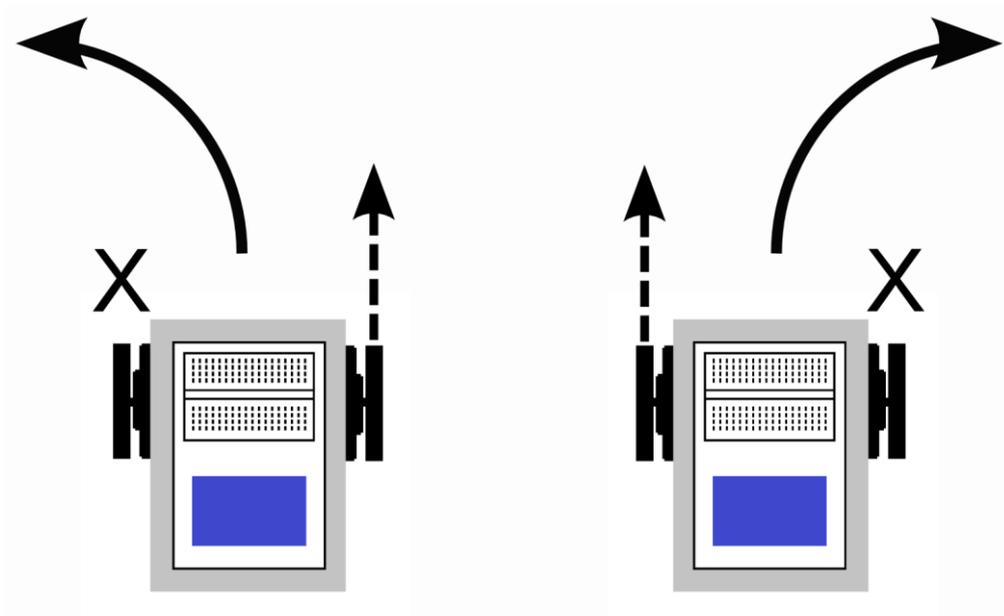


Figura 6.23 - Deslocamento de 10 cm para frente.

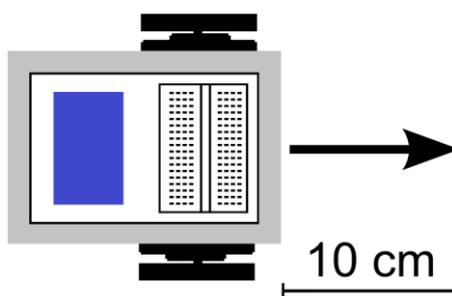


Figura 6.24 - Curva de 90° para a direita.

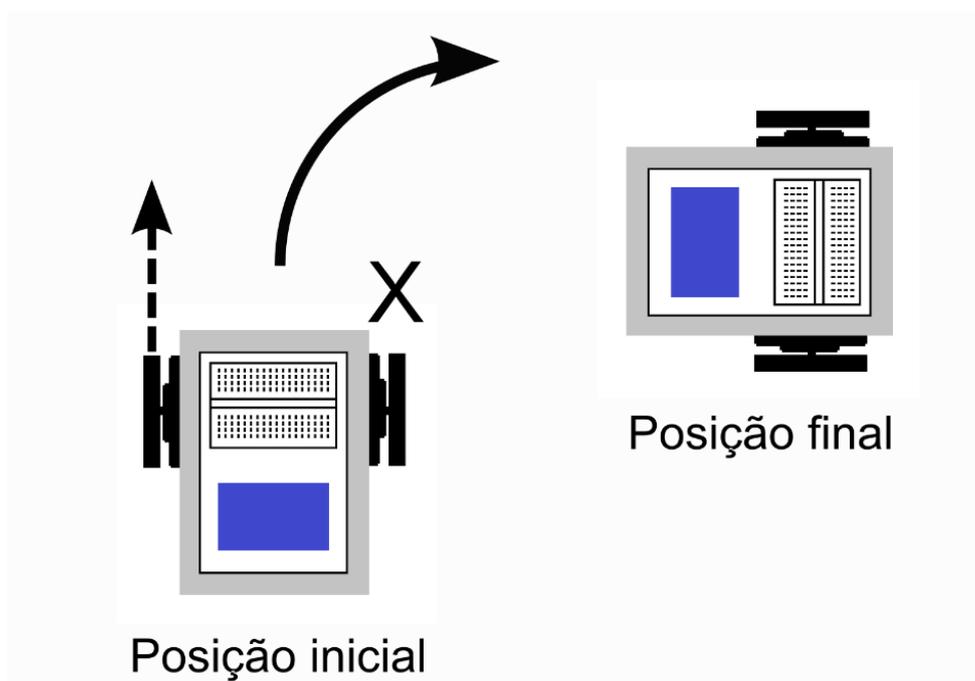


Figura 6.25 - Curva de 90° para a esquerda.

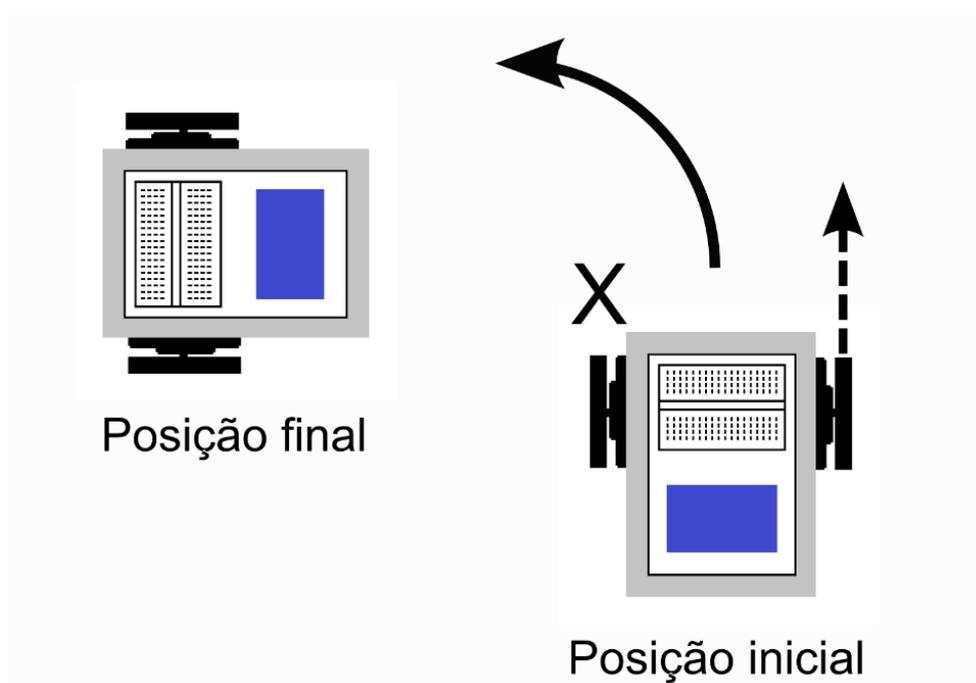
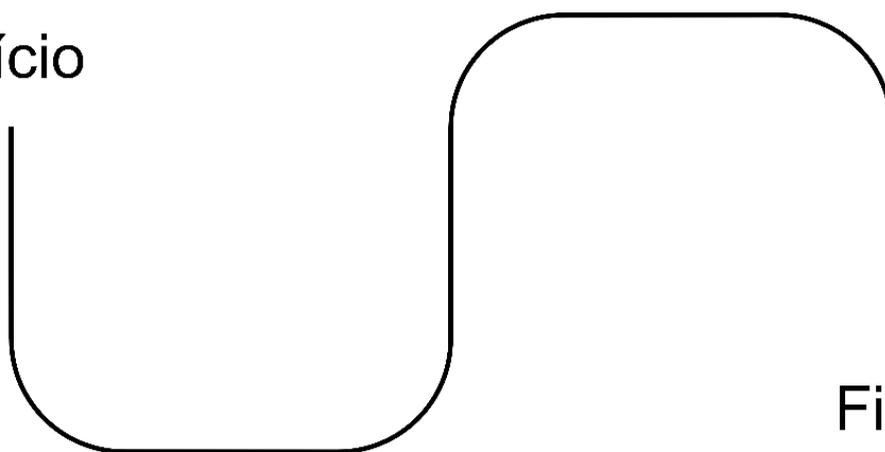


Figura 6.26 - Trajetória a ser percorrida pelo robô.

Início



Fim

Figura 6.27 - Trajetória dividida em trechos distintos.

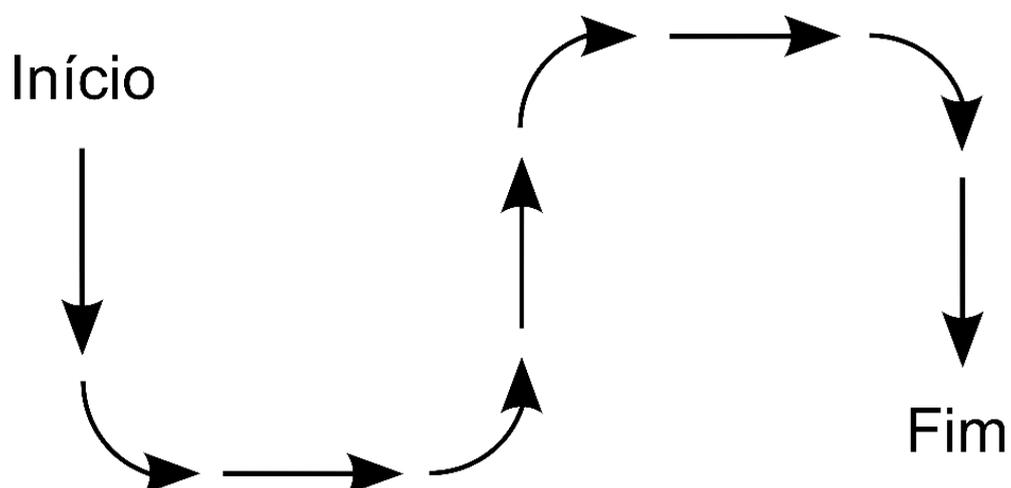


Figura 7.1 - Prendendo os suportes no chassi.

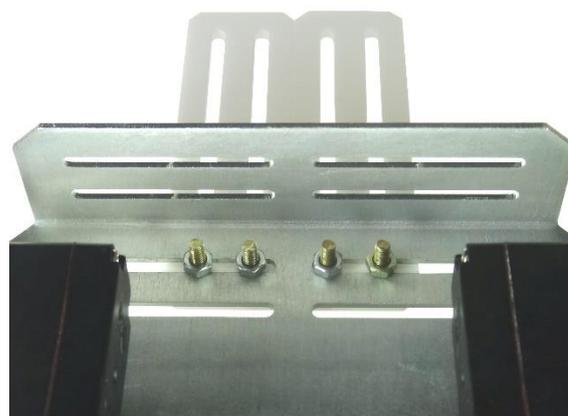


Figura 7.2 - Prendendo a micro chave nos suportes.

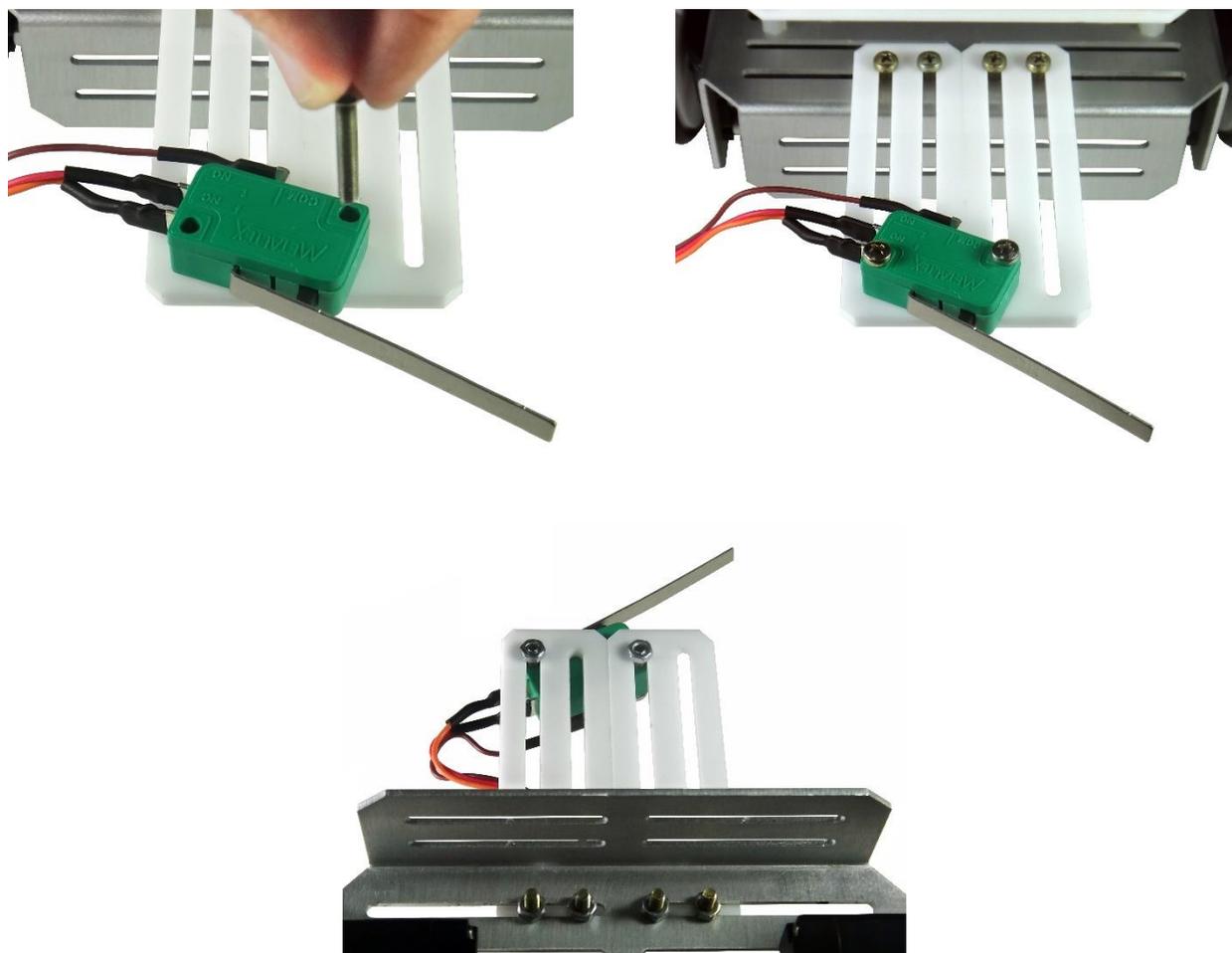


Figura 7.3 - Ligando a micro chave na protoboard.

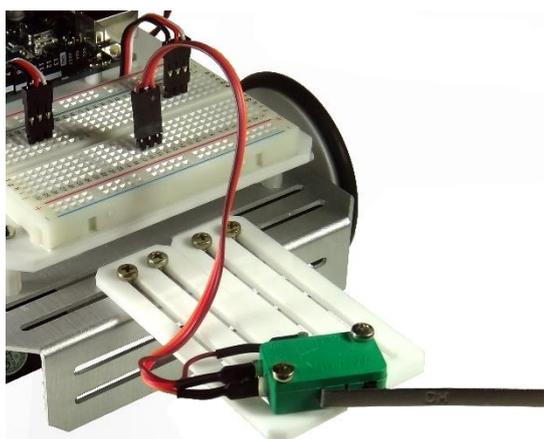


Figura 7.4 - Robô pronto para a realização da atividade.

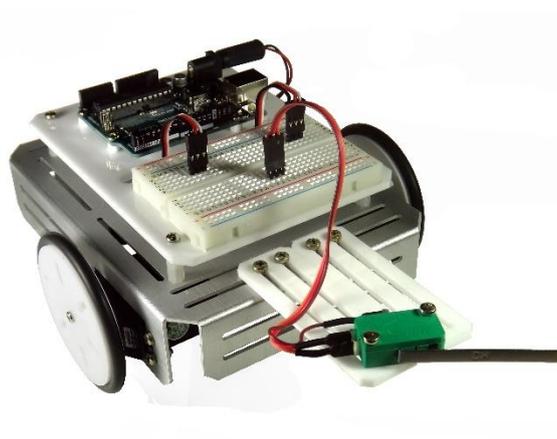
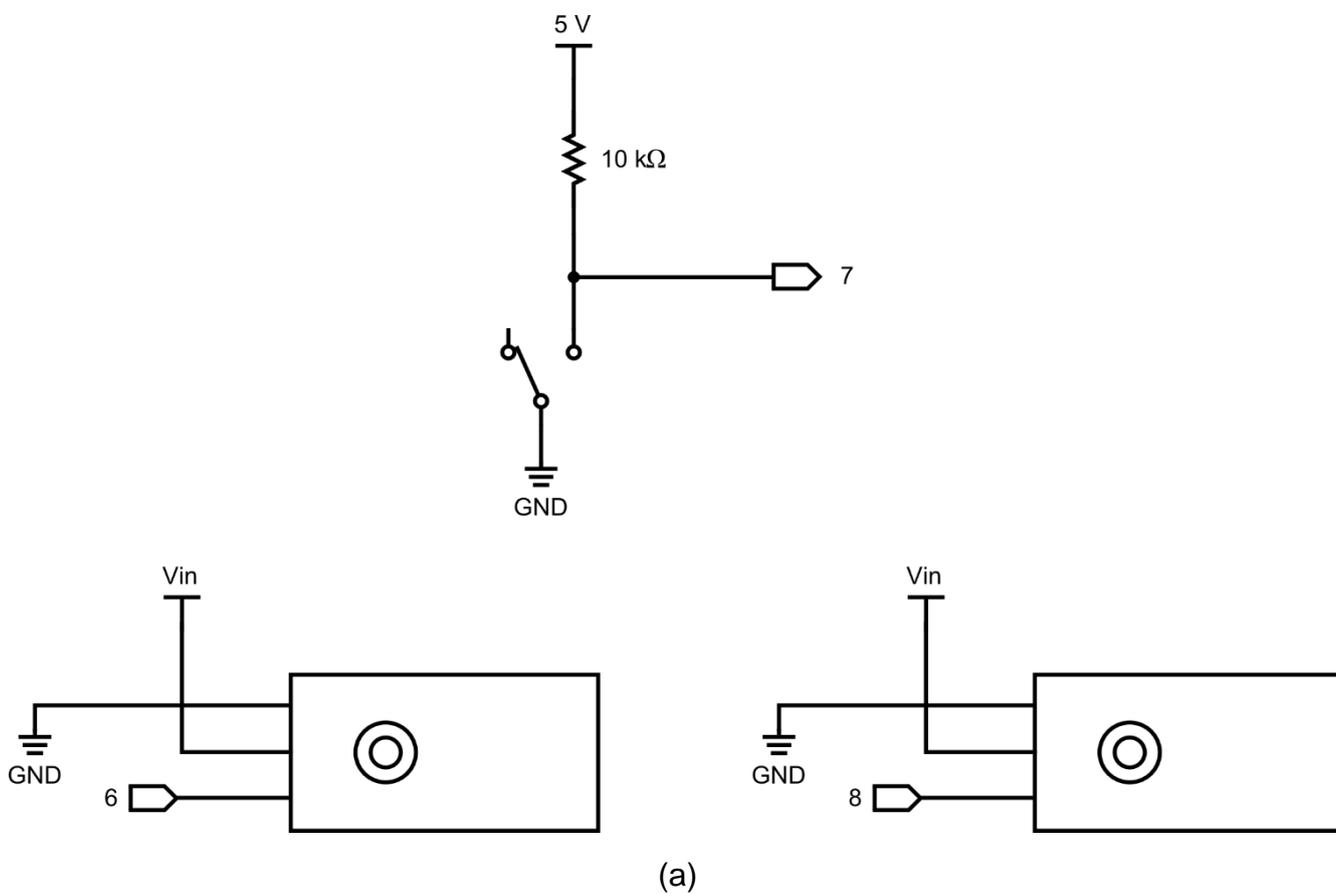
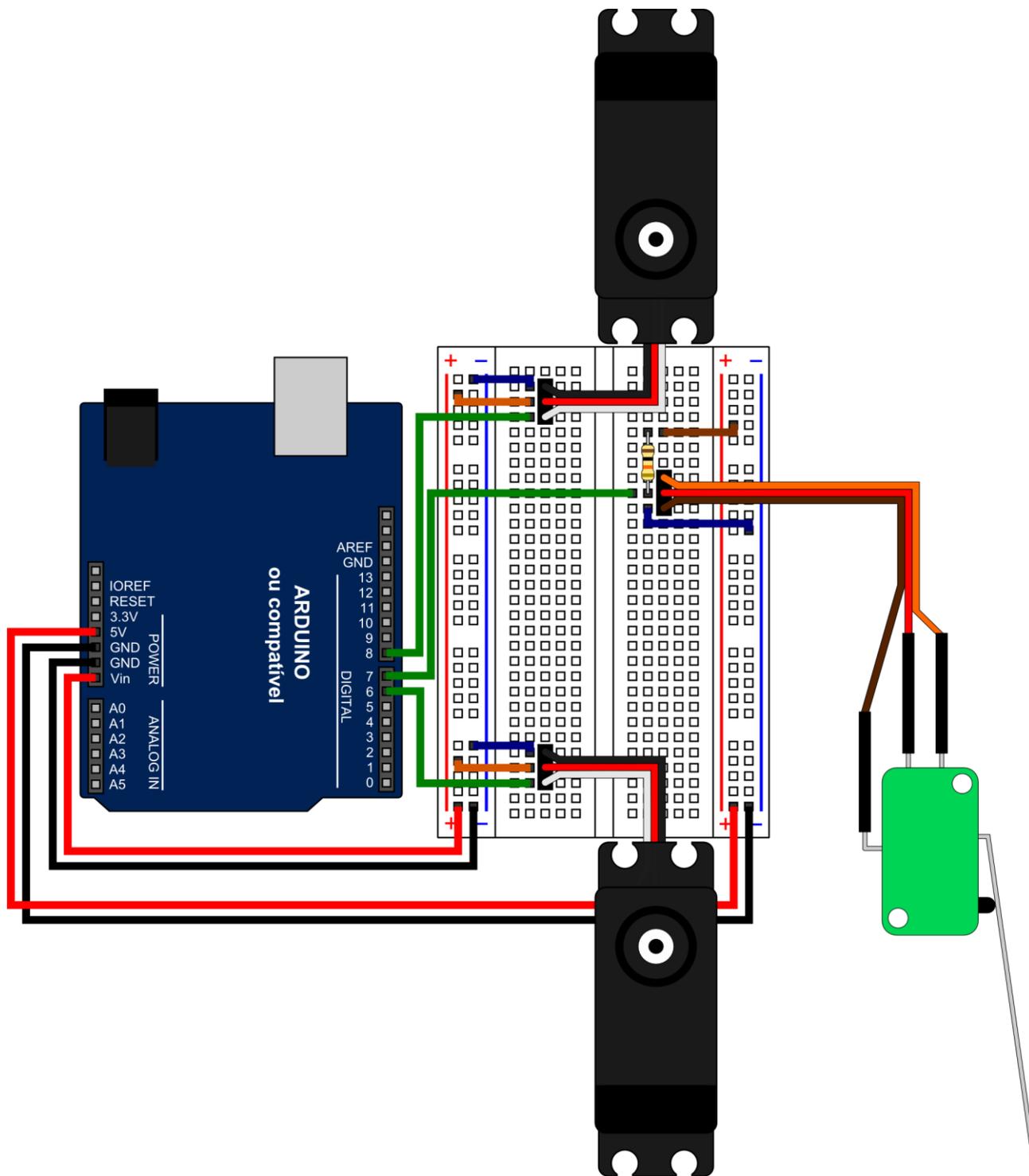


Figura 7.5 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 25.





(b)

Figura 7.6 - Prendendo os suportes no chassi.

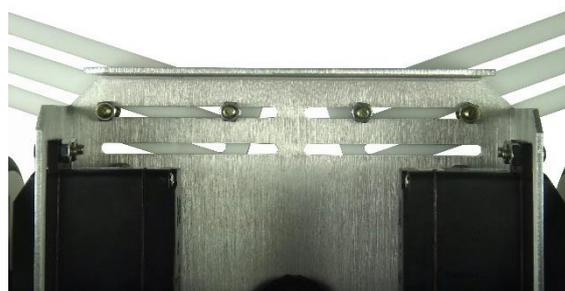
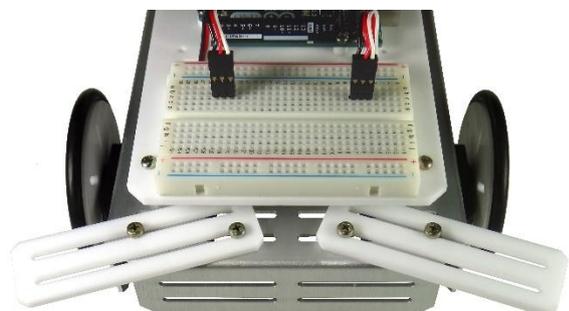
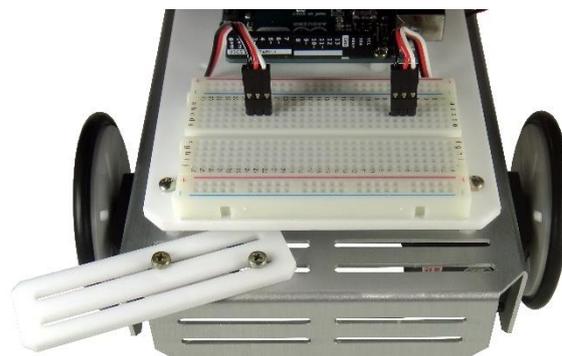


Figura 7.7 - Prendendo as micro chaves nos suportes.

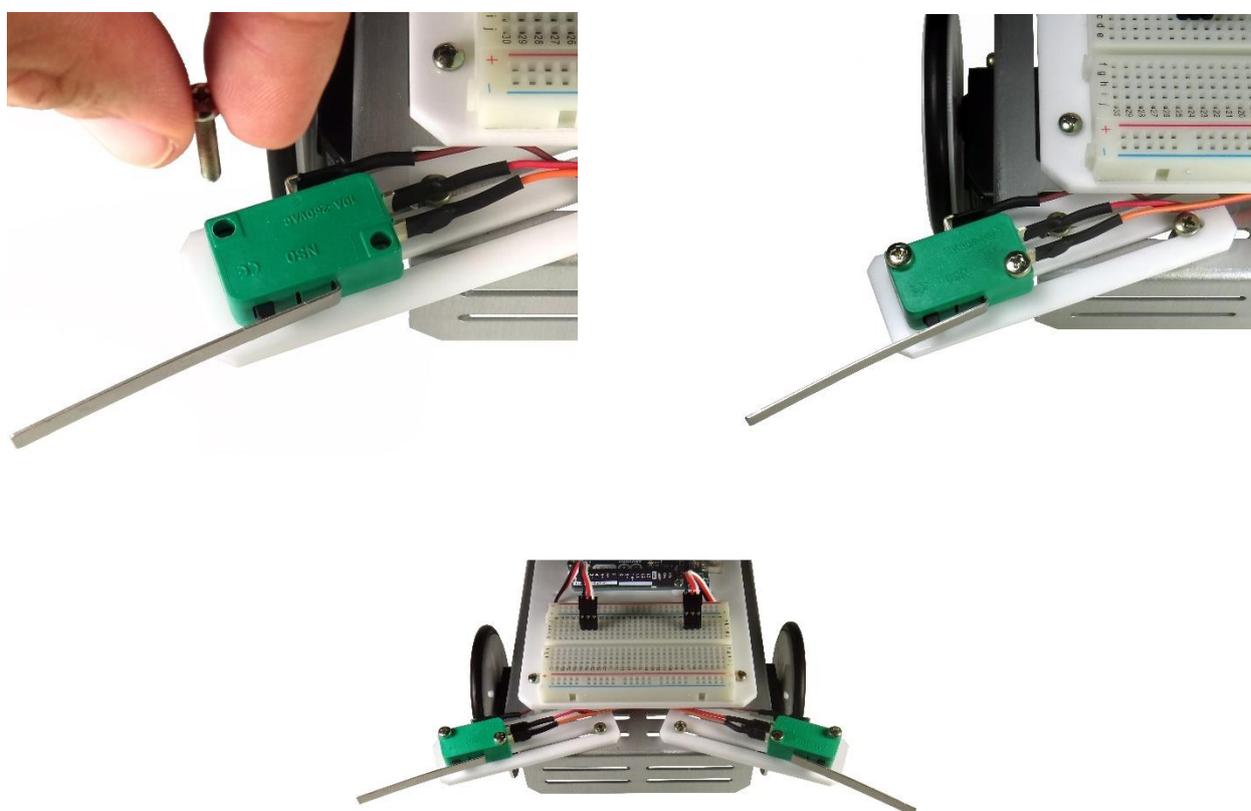


Figura 7.8 - Ligando as micro chaves na protoboard.

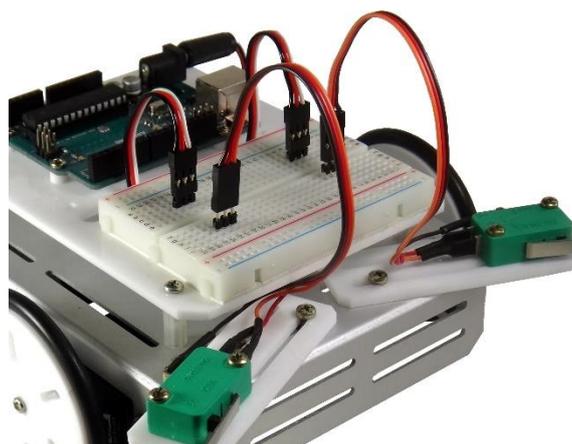


Figura 7.9 - Robô pronto para a realização da atividade.

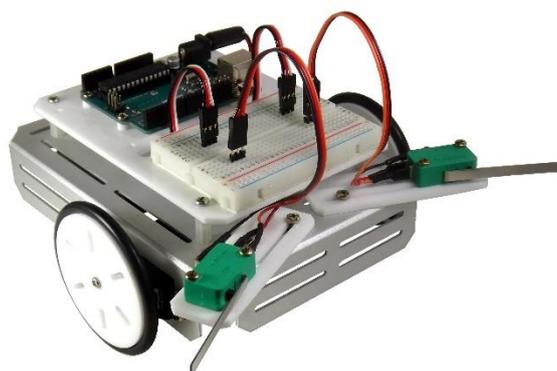
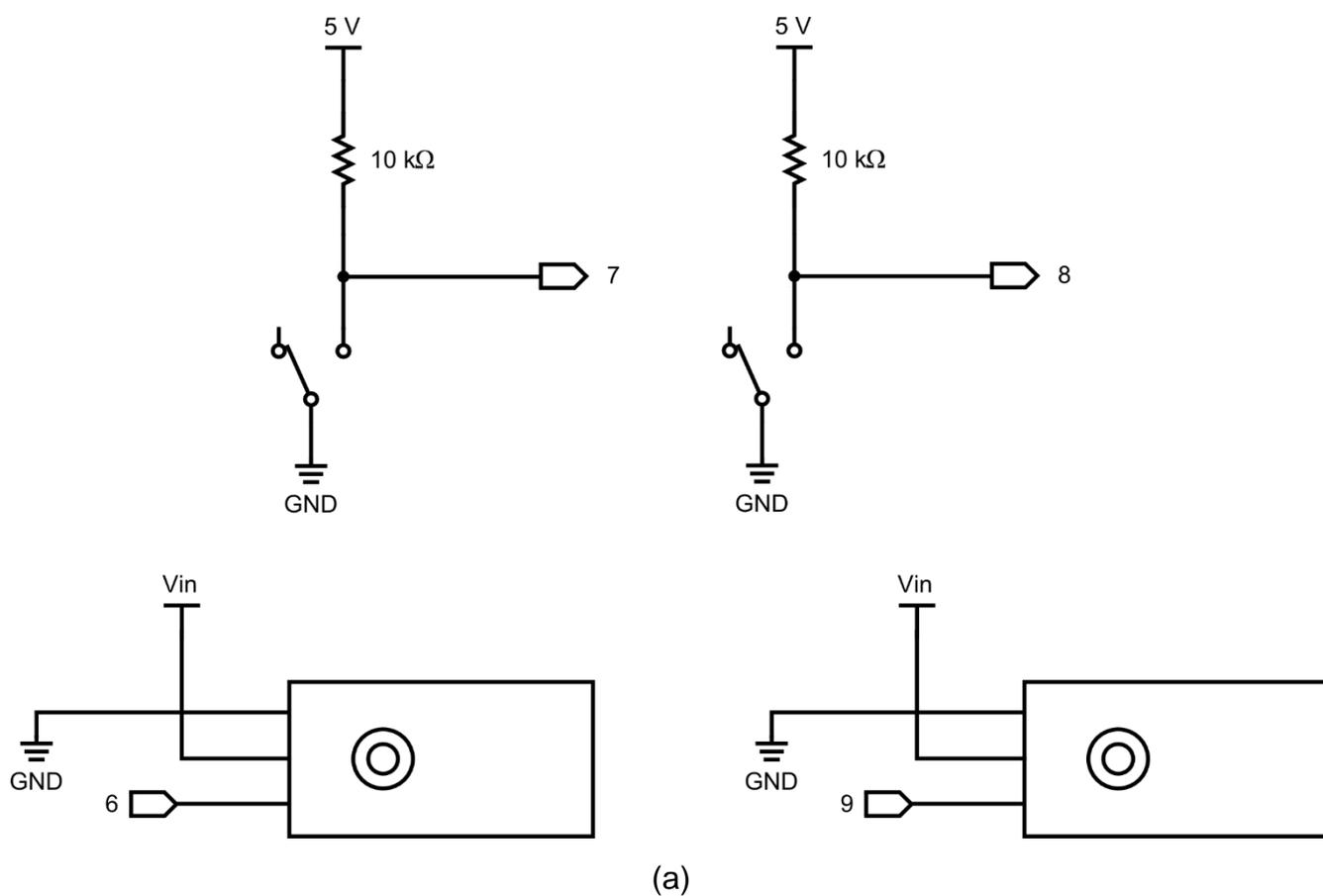
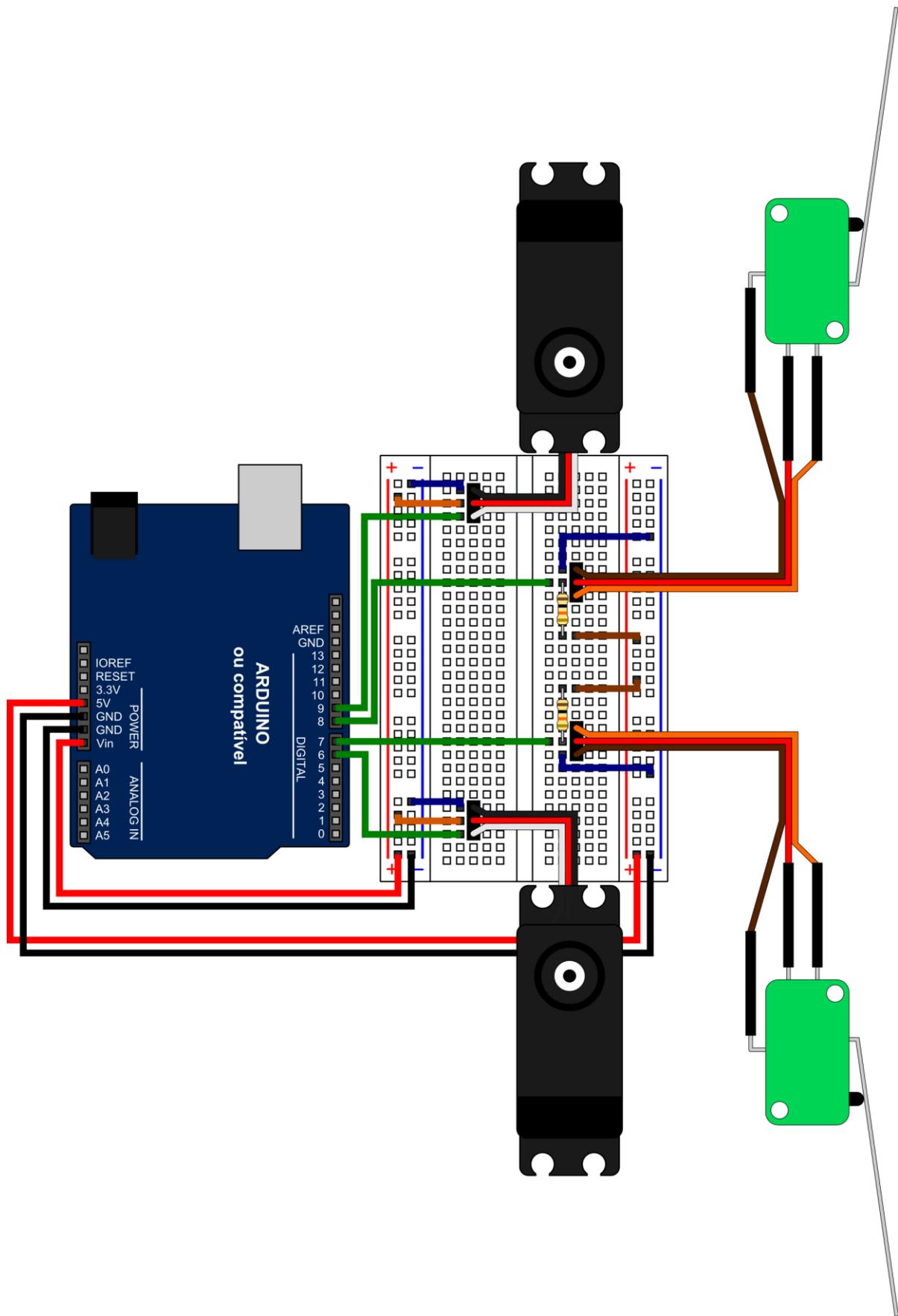


Figura 7.10 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 26.





(b)

Figura 8.1 - Prendendo os cabos extensores no suporte.

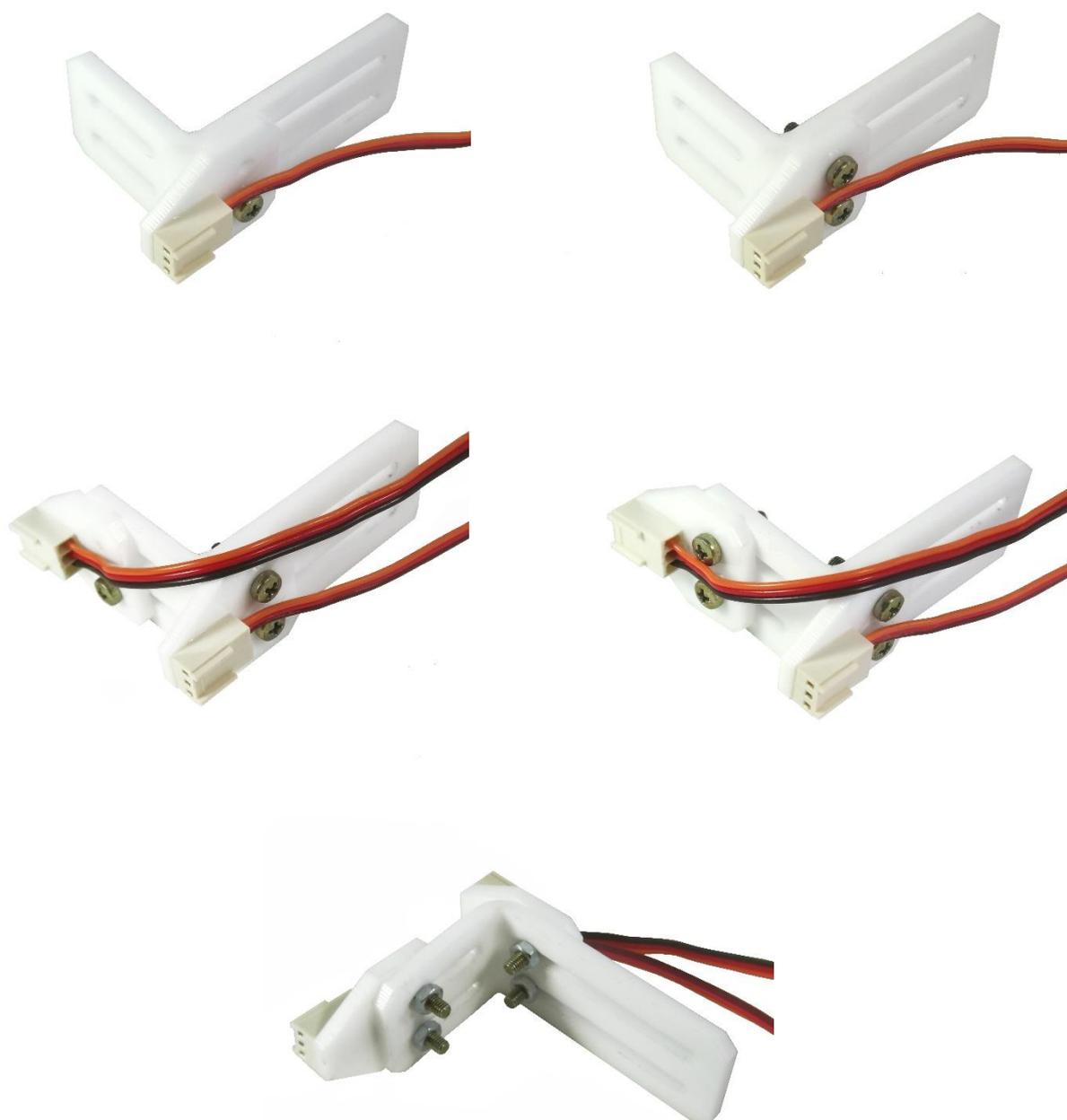


Figura 8.2 - Prendendo o suporte no chassi.

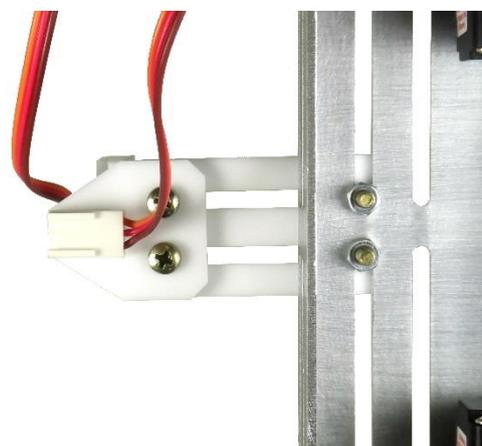
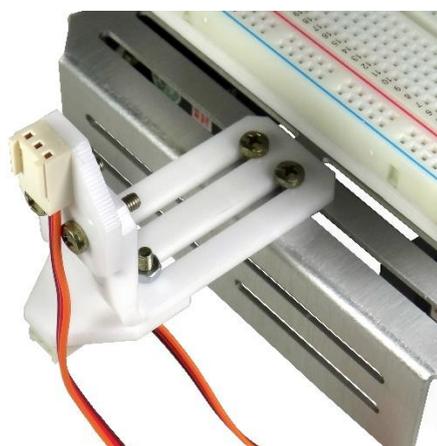
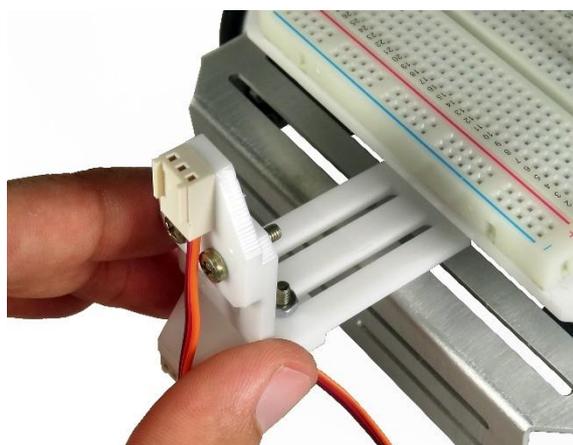


Figura 8.3 - Montando o LED infravermelho dentro do suporte para LED.

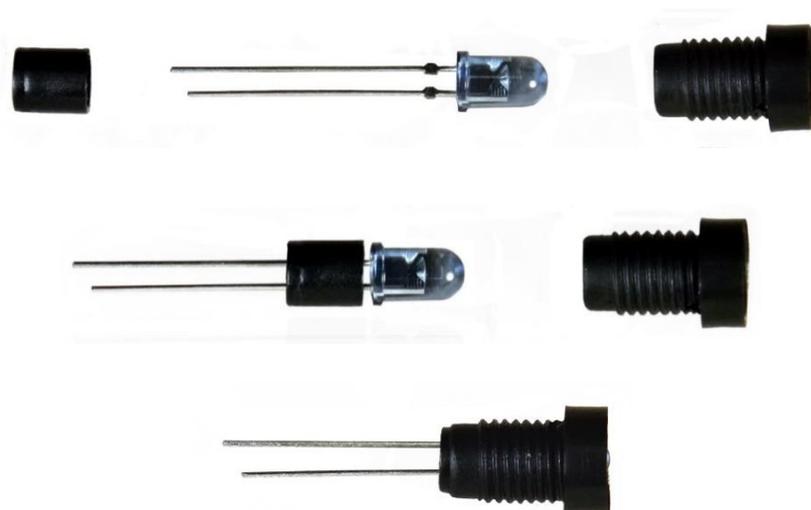


Figura 8.4 - Conectando o LED infravermelho no cabo extensor.

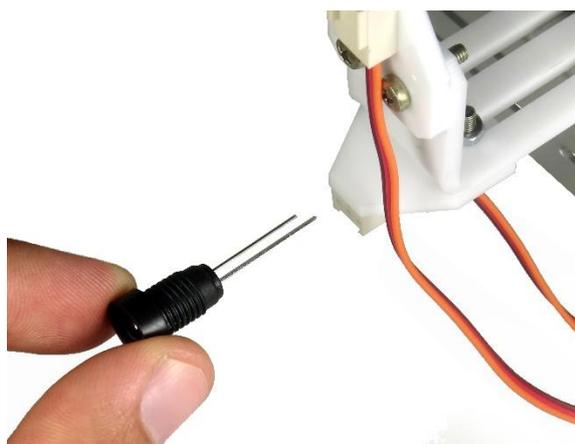


Figura 8.5 - Conectando o receptor de infravermelho no cabo extensor.



Figura 8.6 - Ligando os cabos extensores na protoboard.

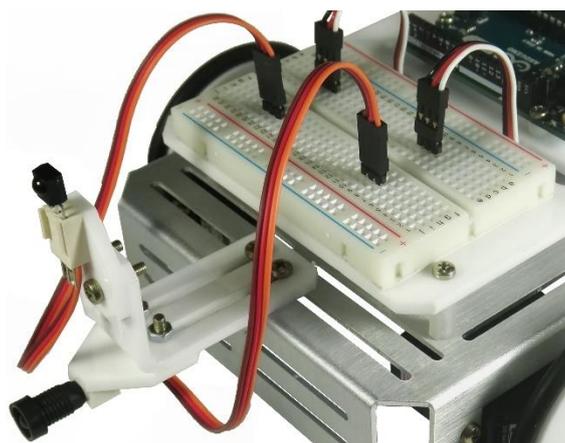


Figura 8.7 - Robô pronto para a realização da atividade.

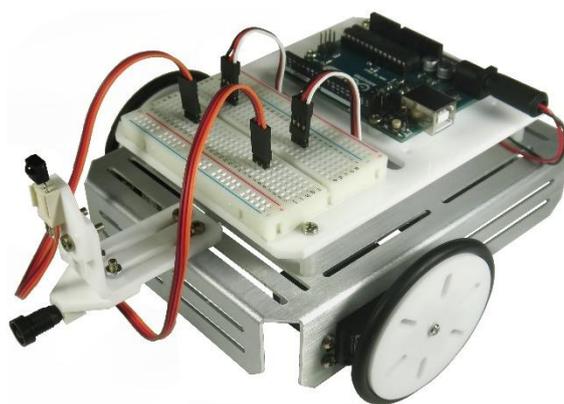
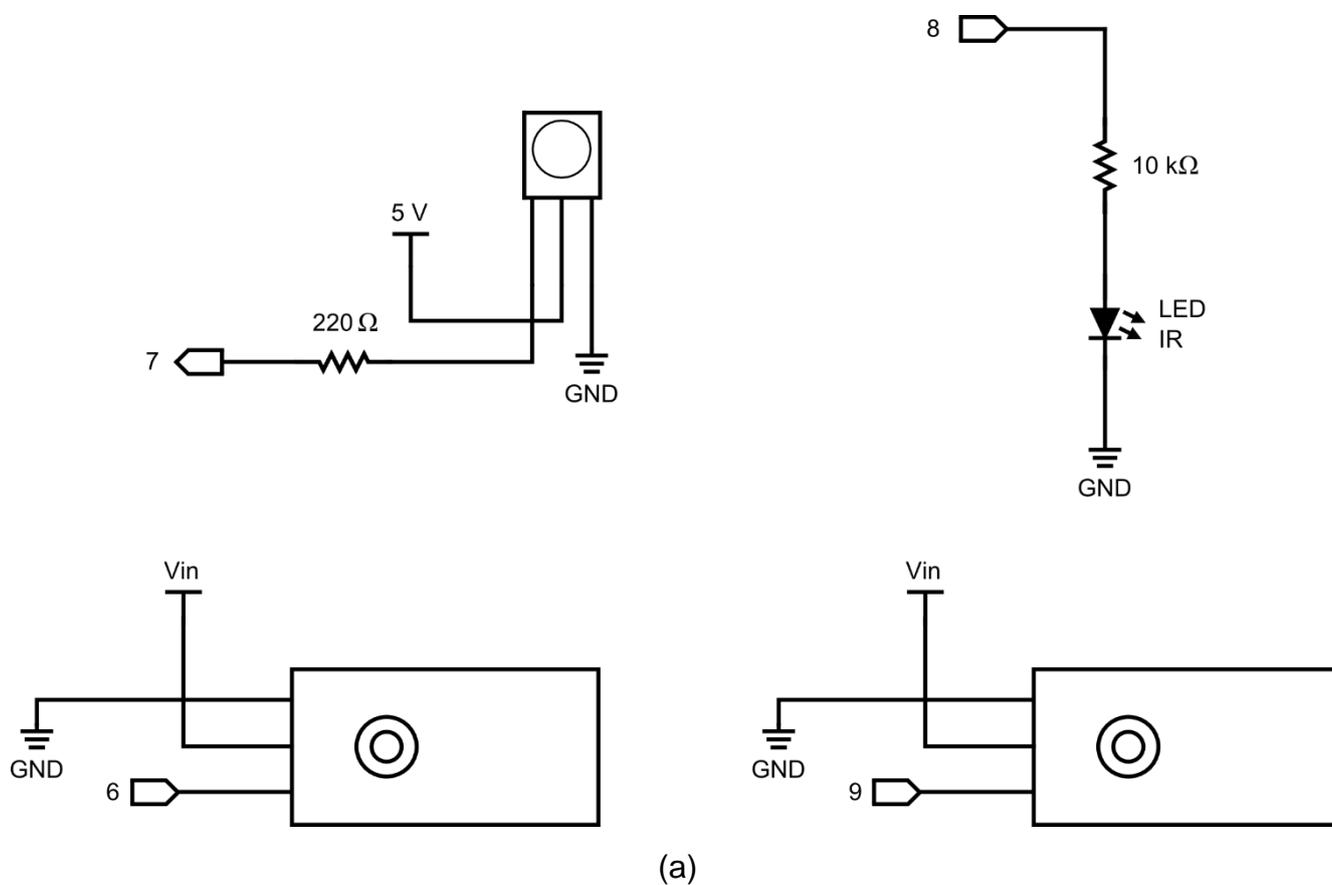
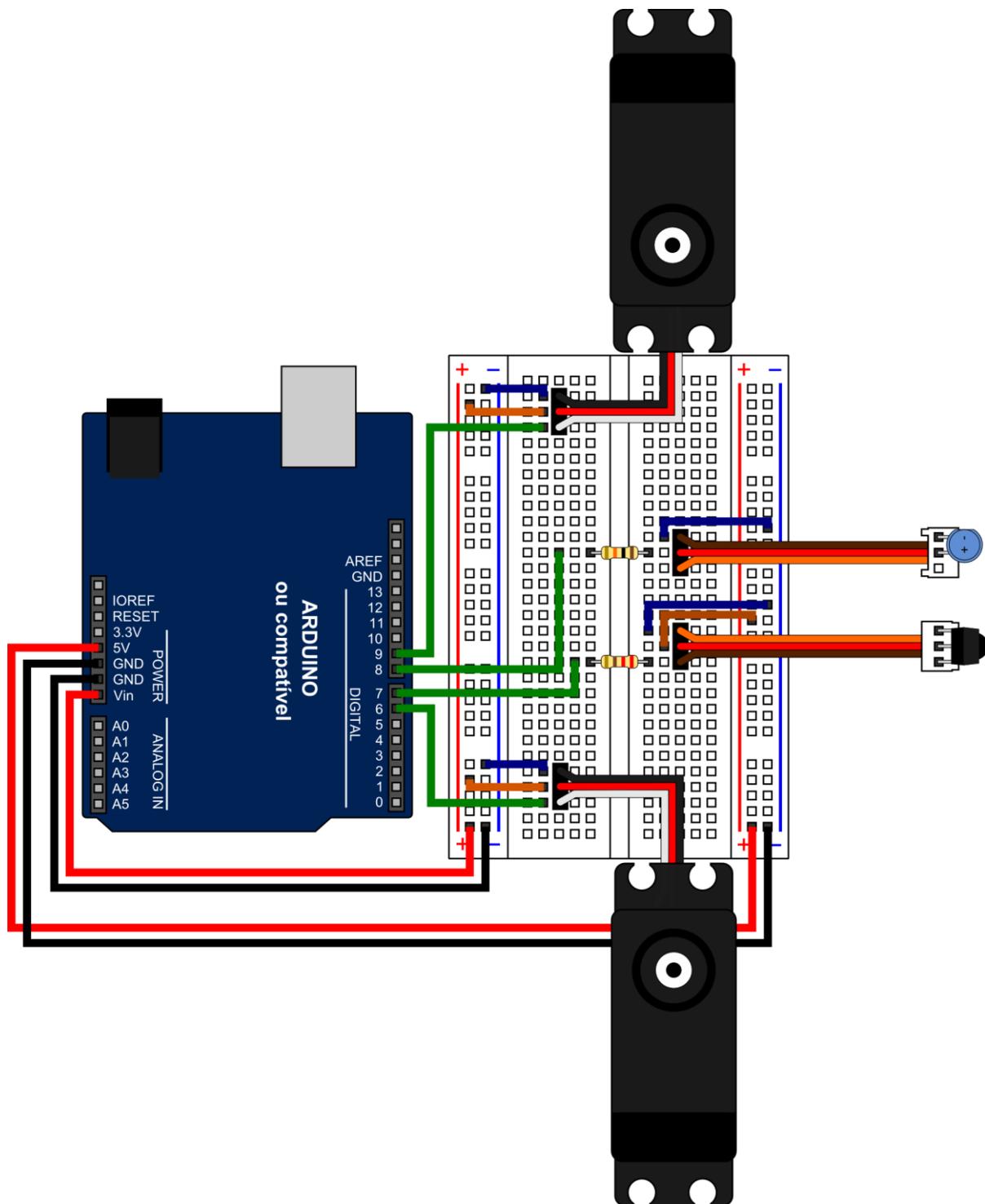


Figura 8.8 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 27.





(b)

Figura 8.9 - Prendendo os cabos extensores nos suportes.

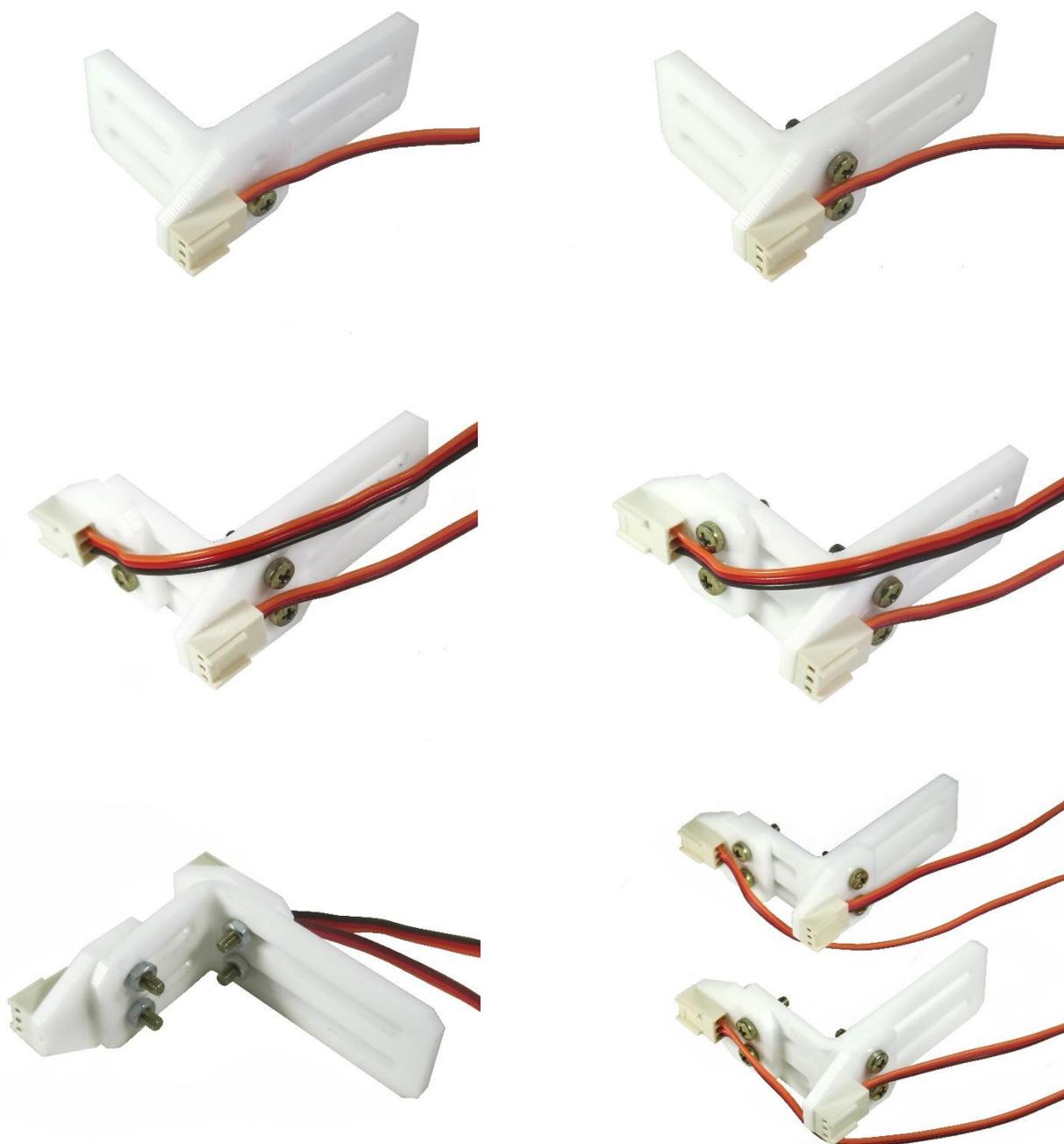


Figura 8.10 - Prendendo os suportes no chassi.

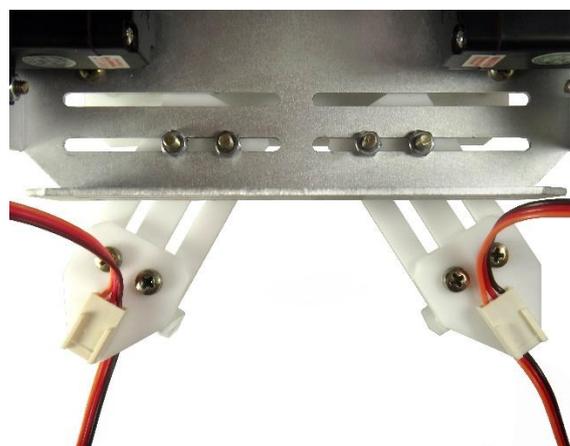
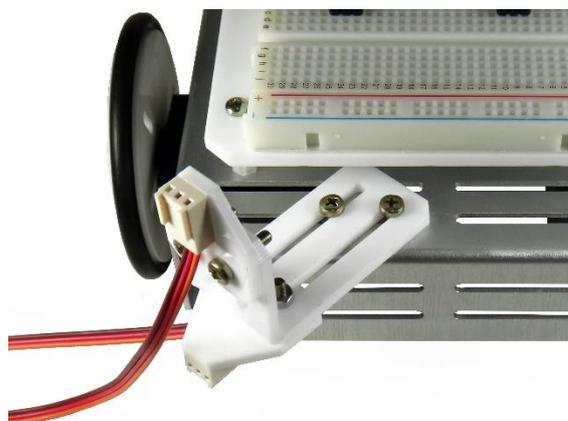


Figura 8.11 - Montando os LEDs infravermelhos dentro dos suportes para LED.

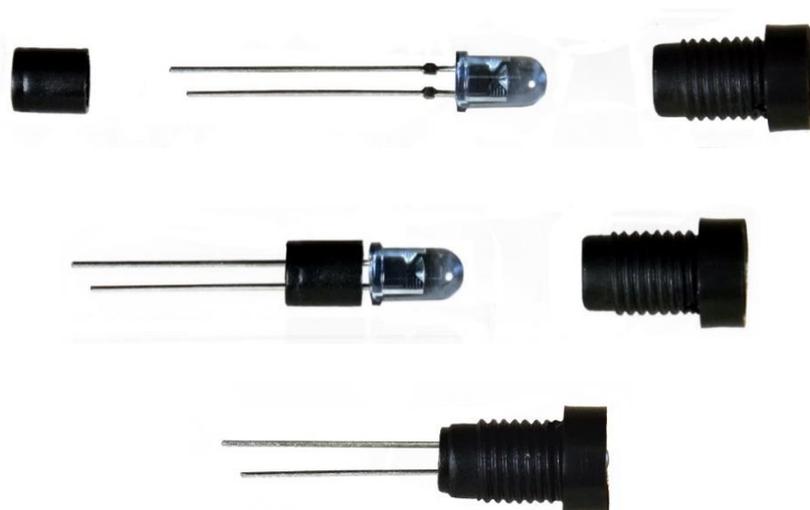


Figura 8.12 - Conectando os LEDs infravermelhos nos cabos extensores.



Figura 8.13 - Conectando os receptores de infravermelho nos cabos extensores.

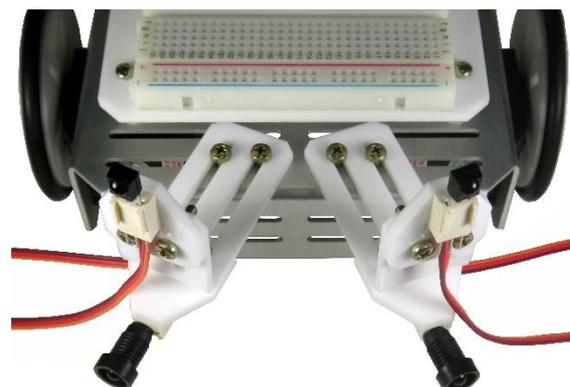
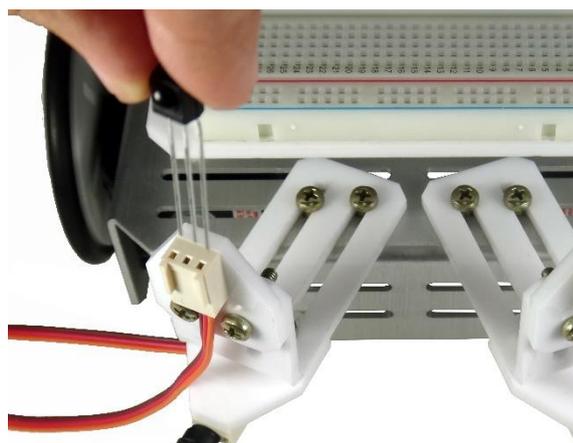


Figura 8.14 - Ligando os cabos extensores na protoboard.

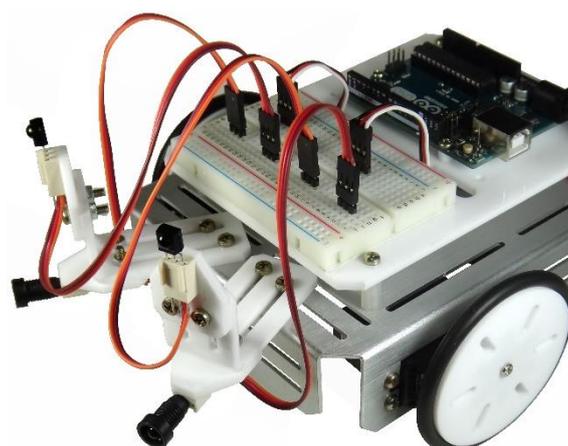


Figura 8.15 - Robô pronto para a realização da atividade.

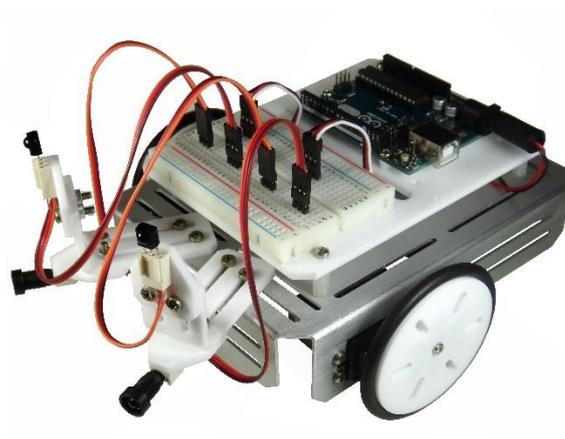
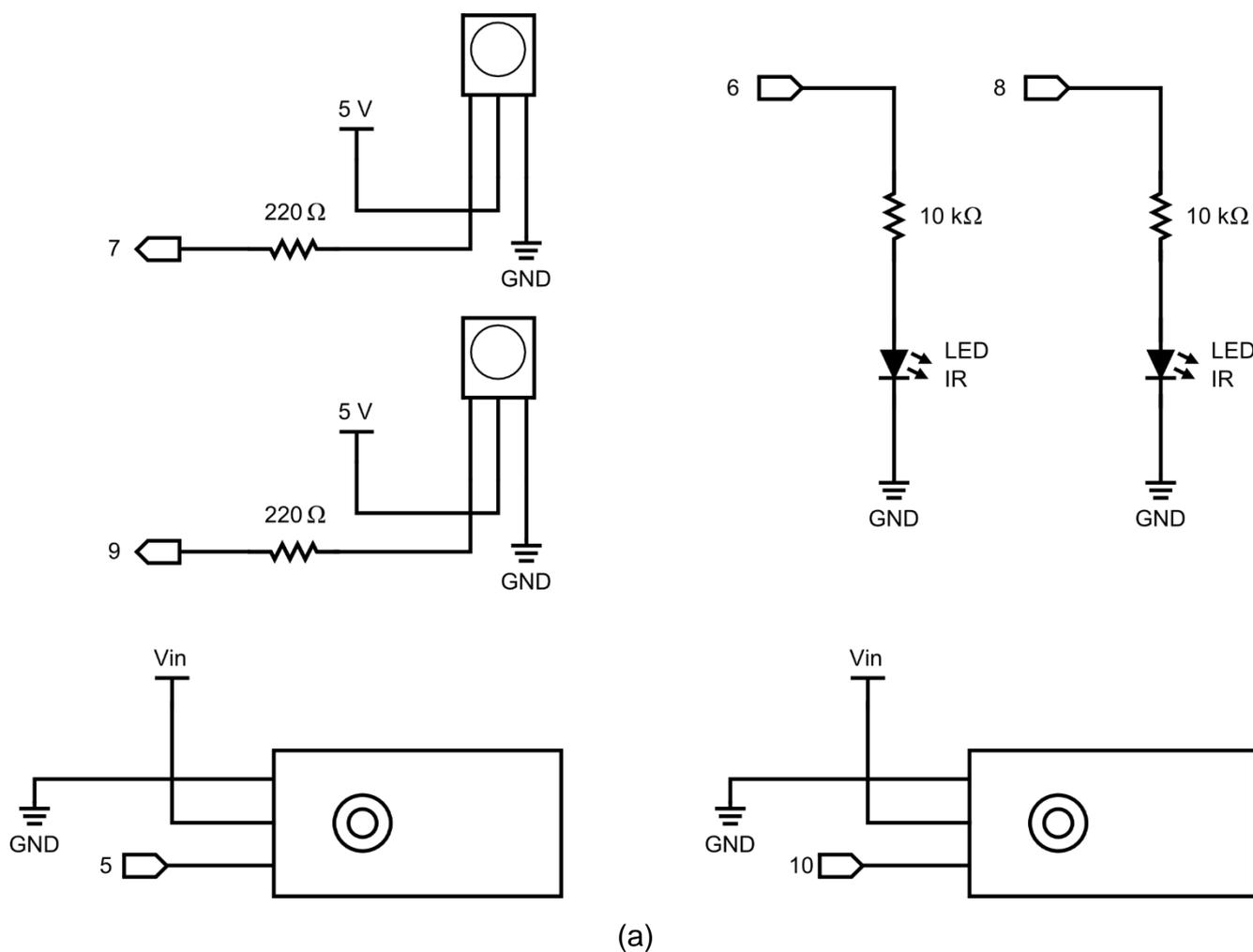
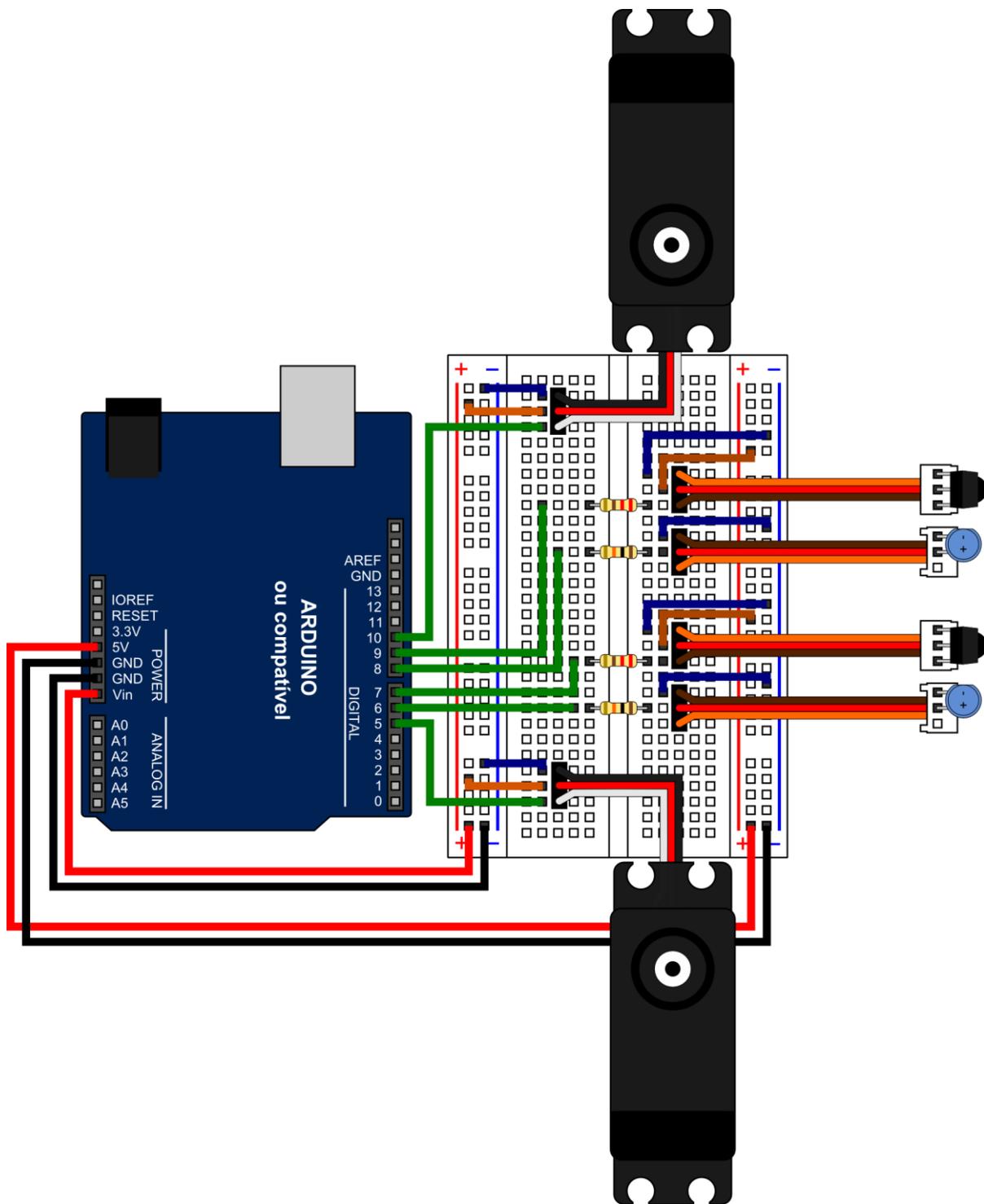


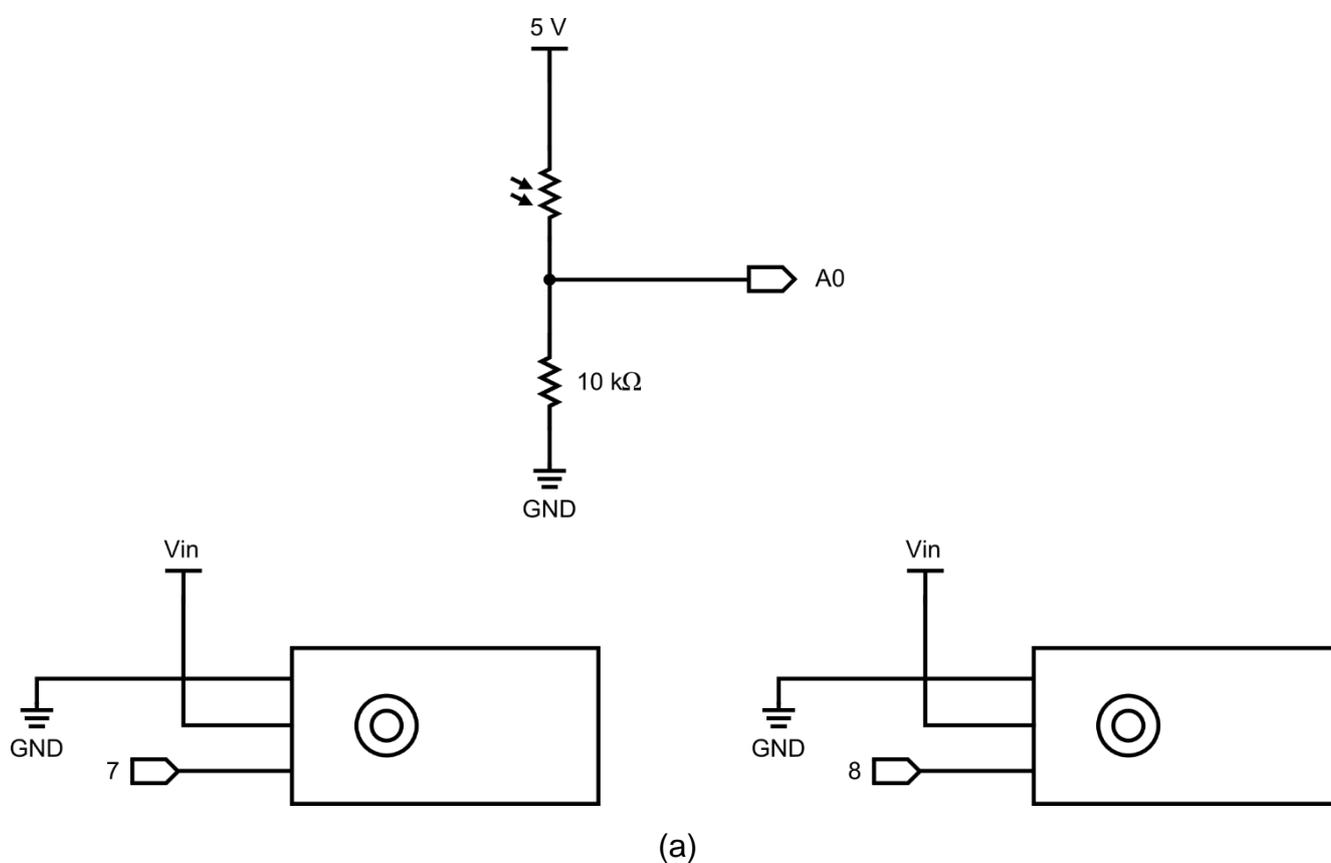
Figura 8.16 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 28.

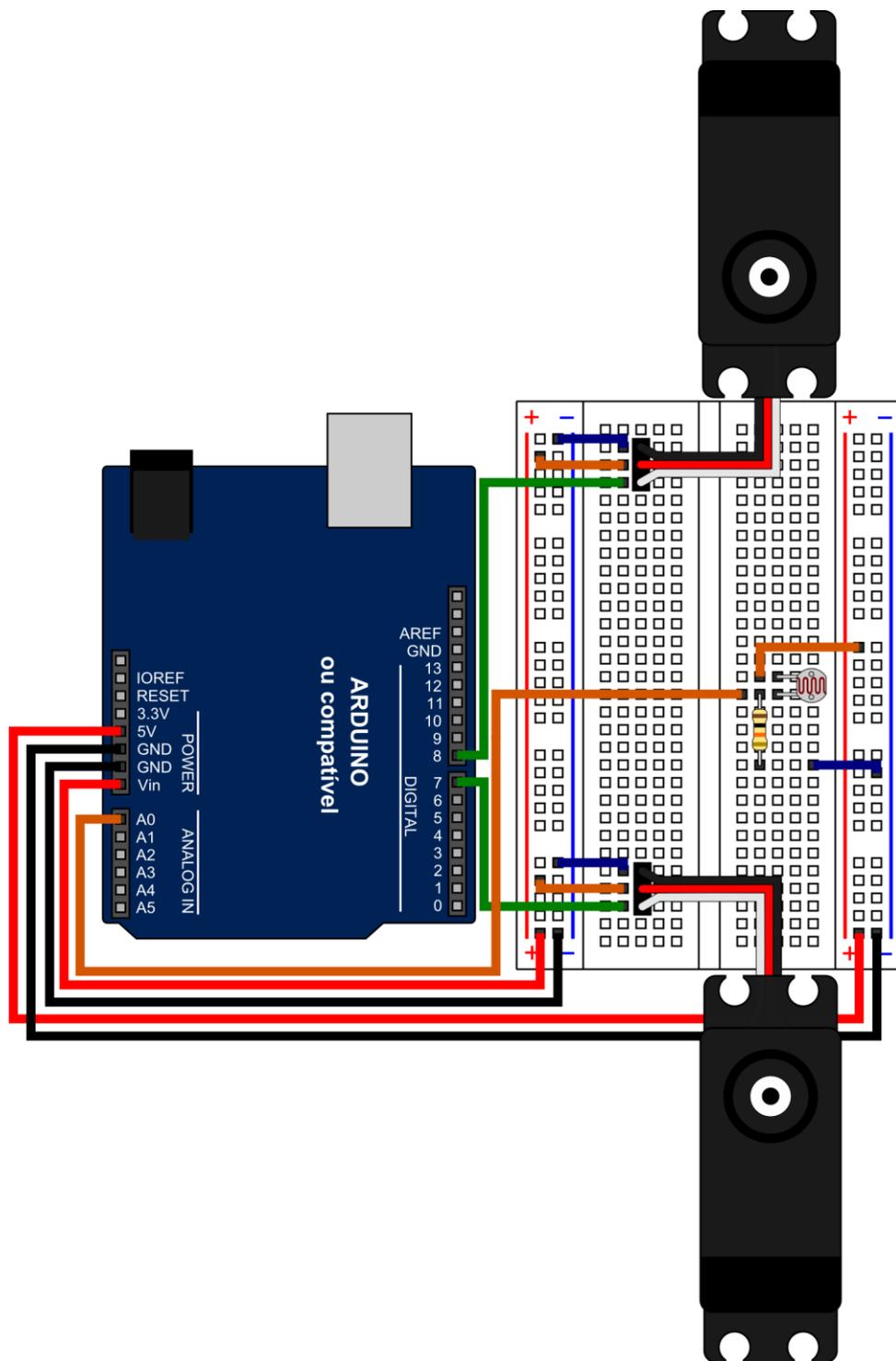




(b)

Figura 9.1 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 29.





(b)

Figura 9.2 - Prendendo os cabos extensores nos suportes.

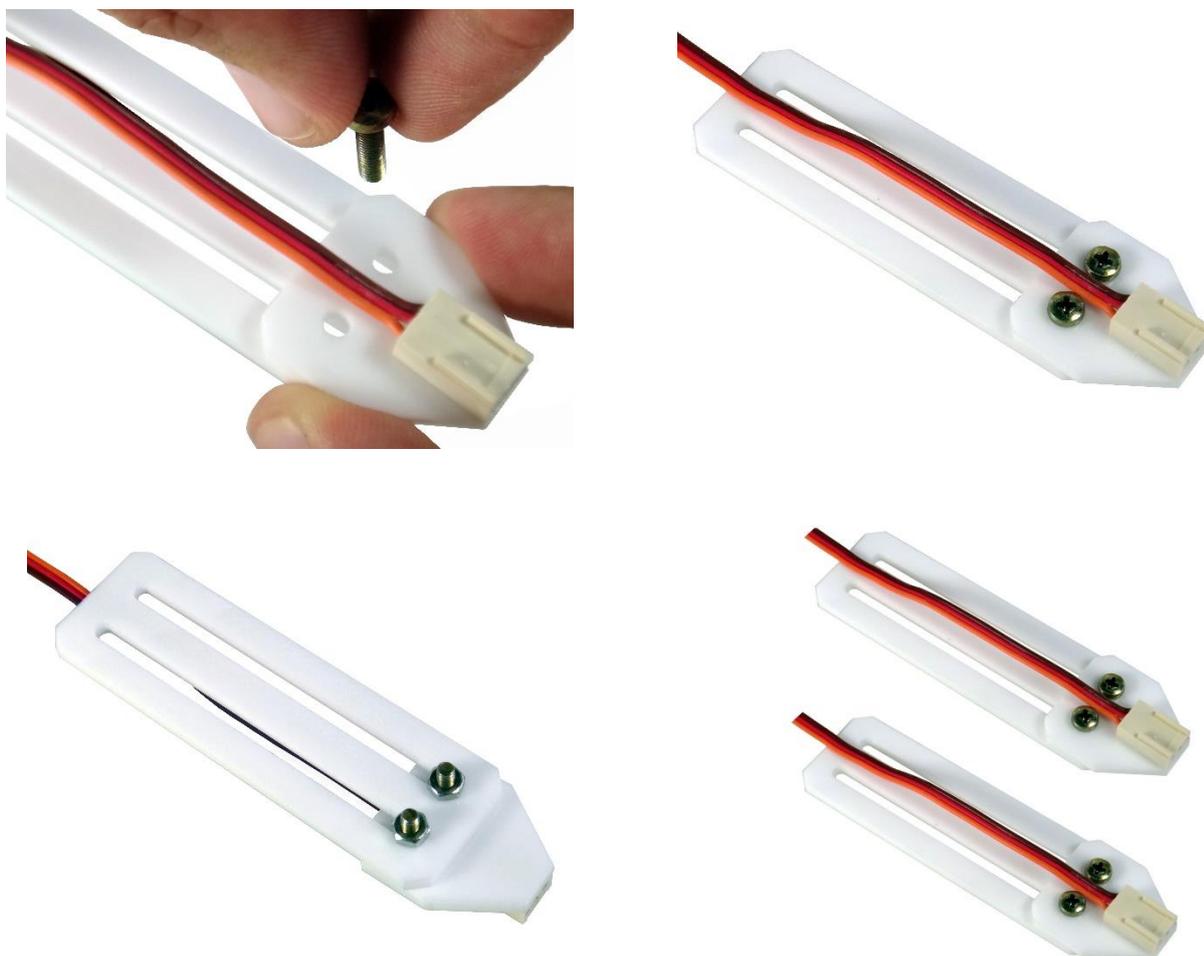


Figura 9.3 - Prendendo os suportes no chassi.

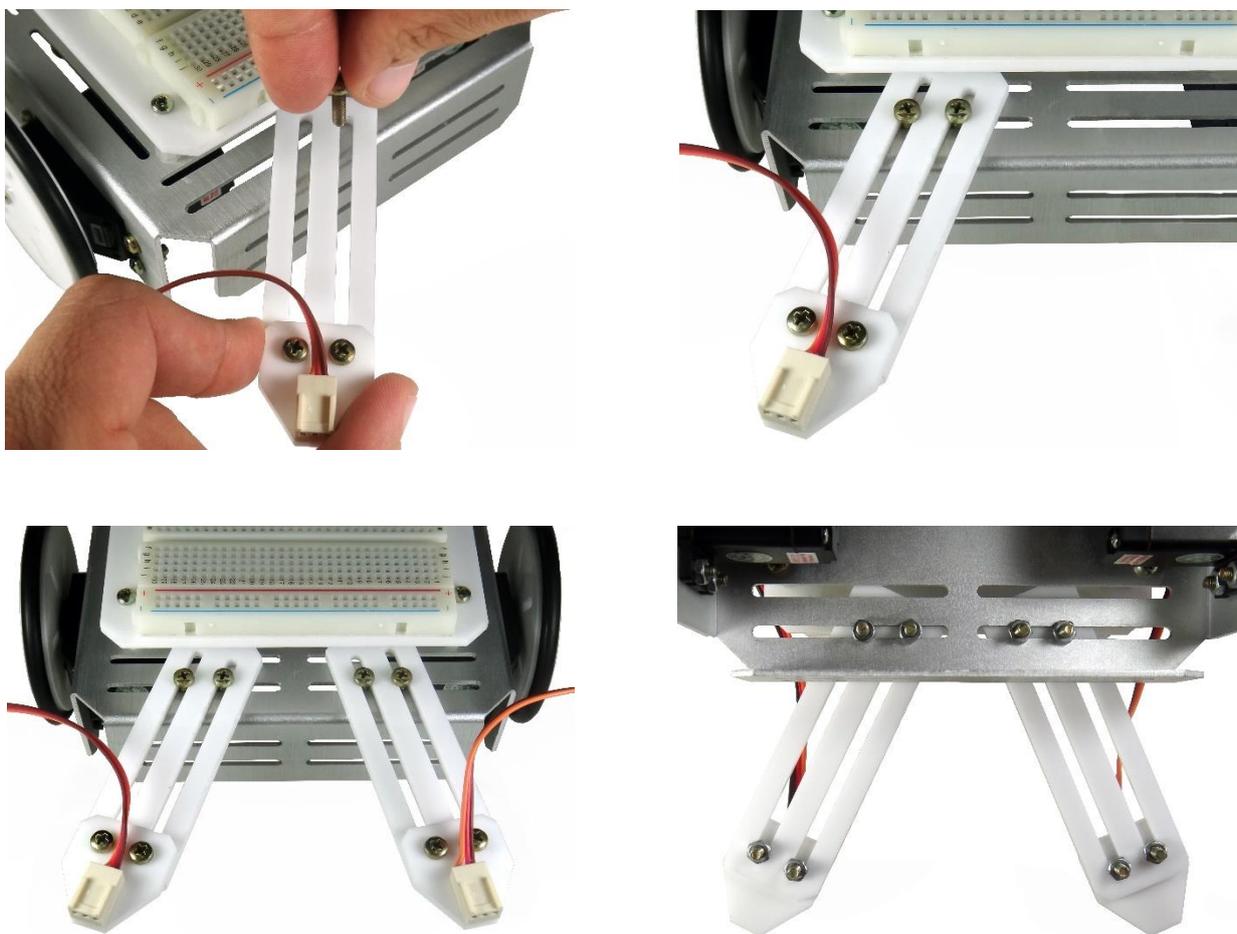


Figura 9.4 - Conectando os foto resistores nos cabo extensores.

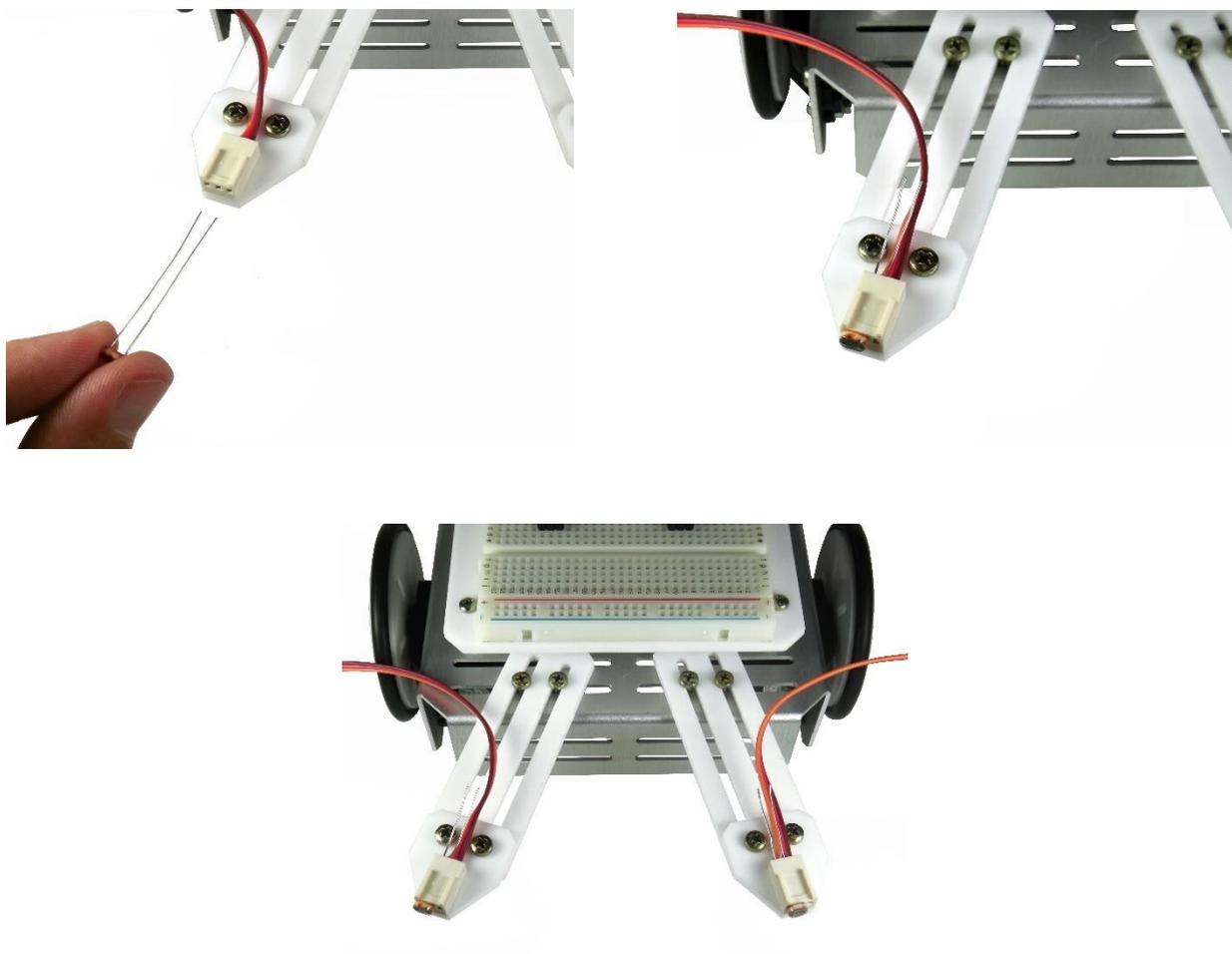


Figura 9.5 - Ligando os cabos extensores na protoboard.

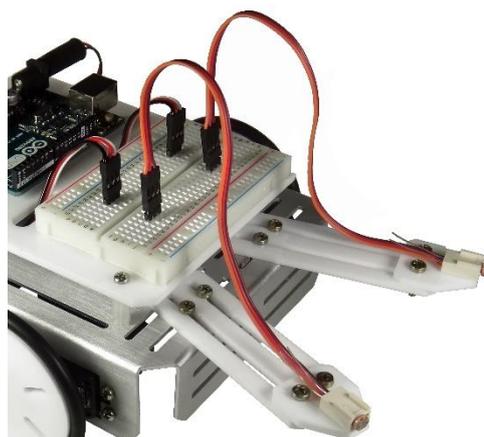


Figura 9.6 - Robô pronto para a realização da atividade.

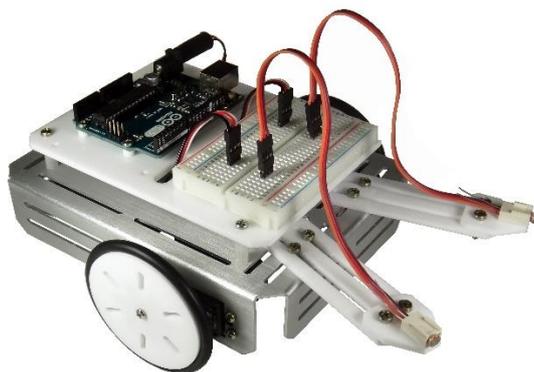
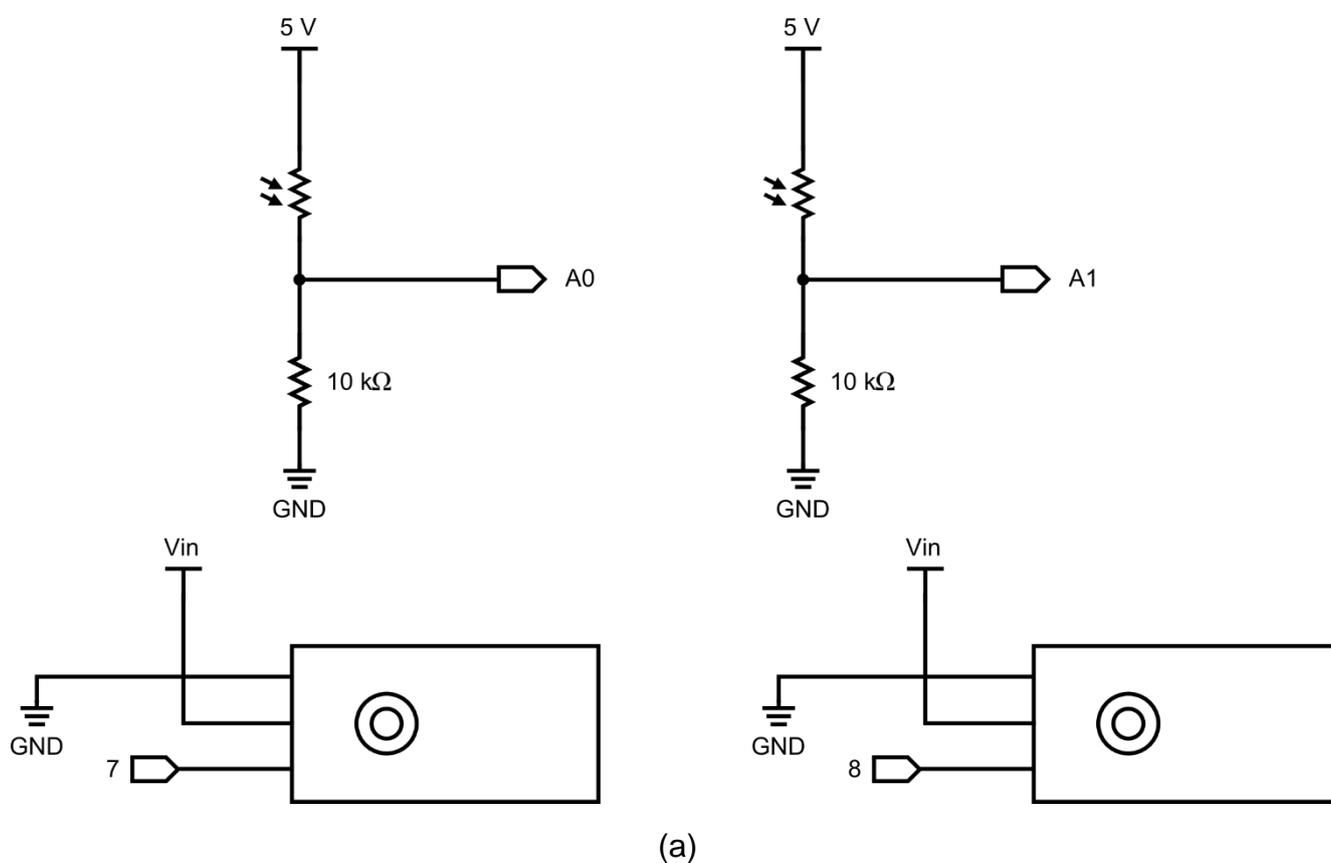
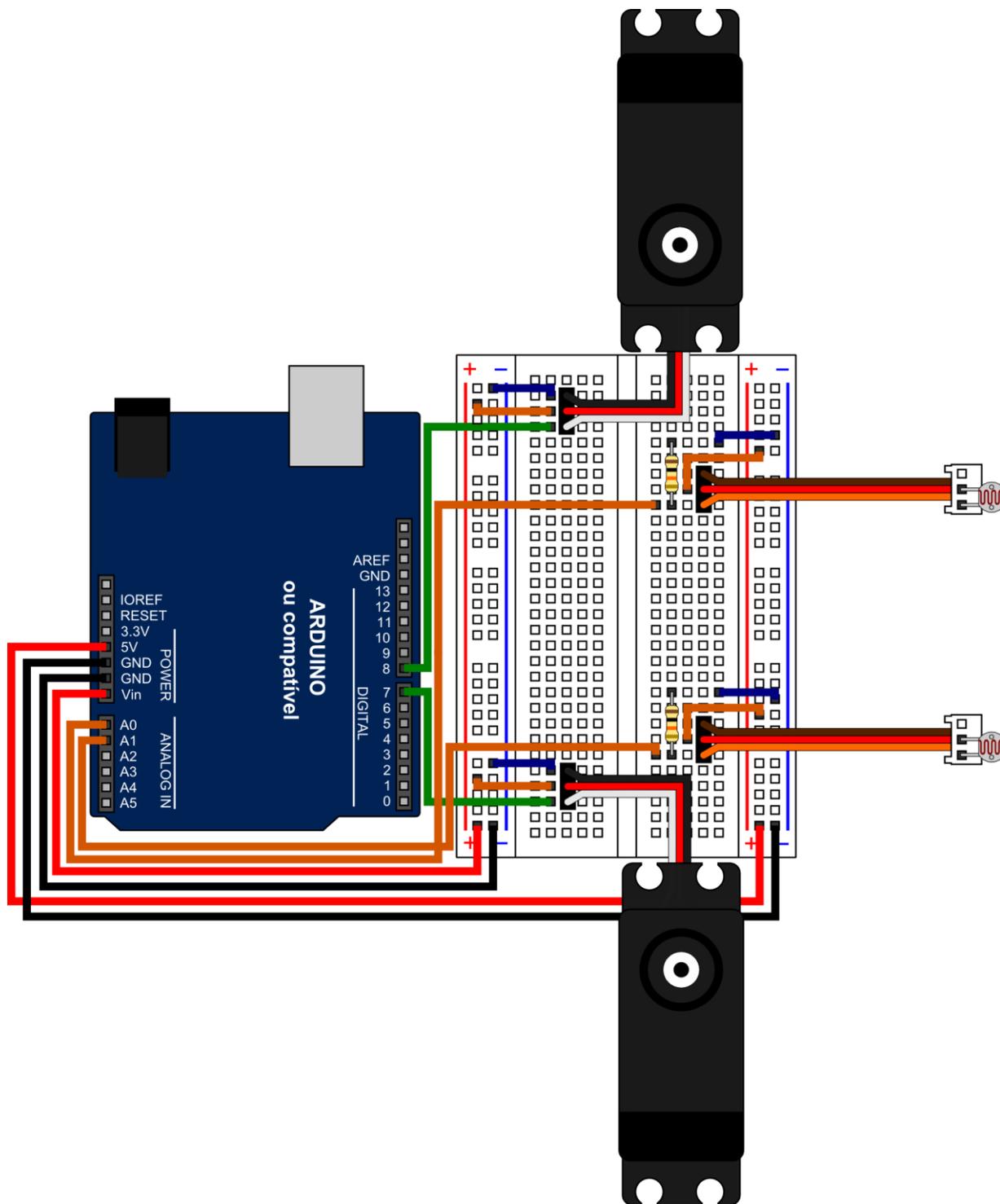


Figura 9.7 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 30.





(b)

Figura 9.8 - Exemplo de traçado feito com fita preta.



Figura 9.9 - Prendendo os cabos extensores no chassi.

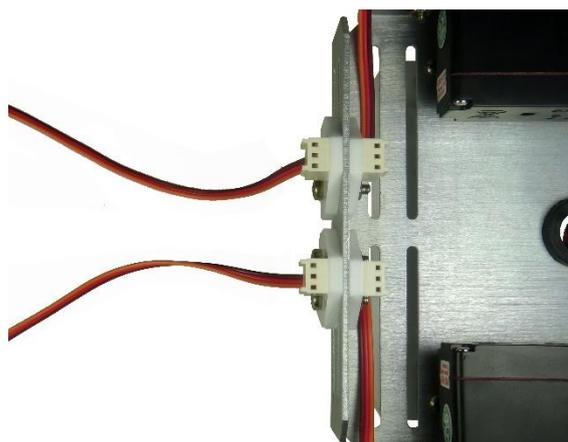
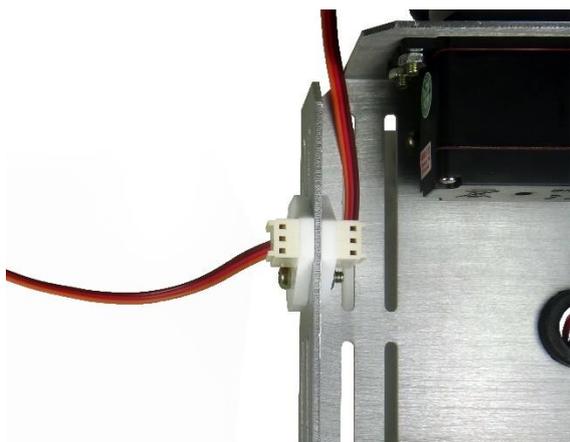
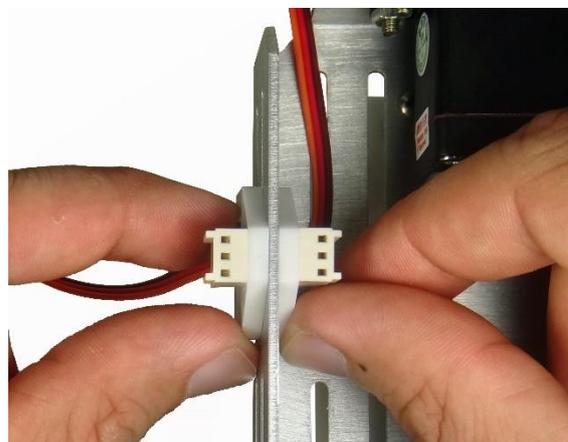
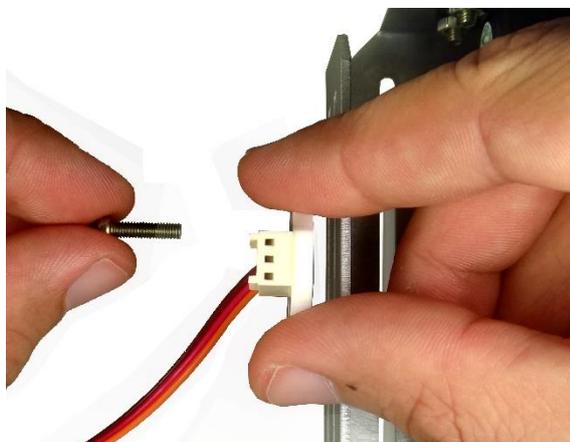


Figura 9.10 - Conectando os LEDs brancos nos cabos extensores.

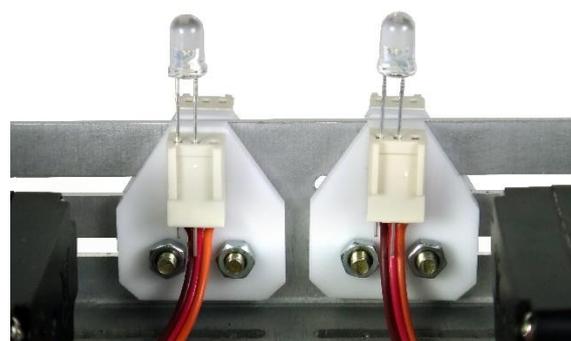
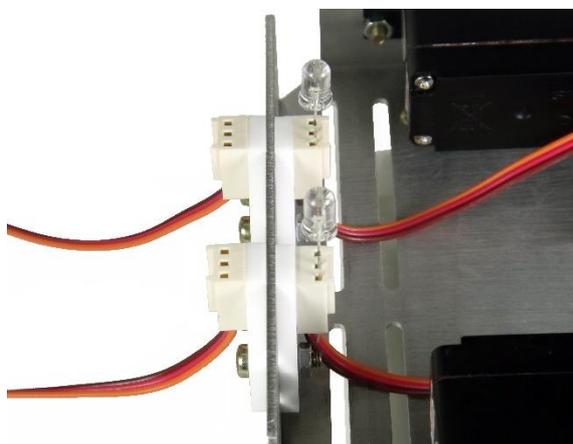
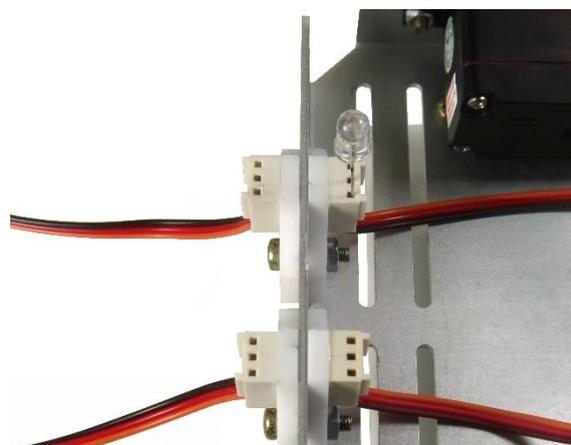
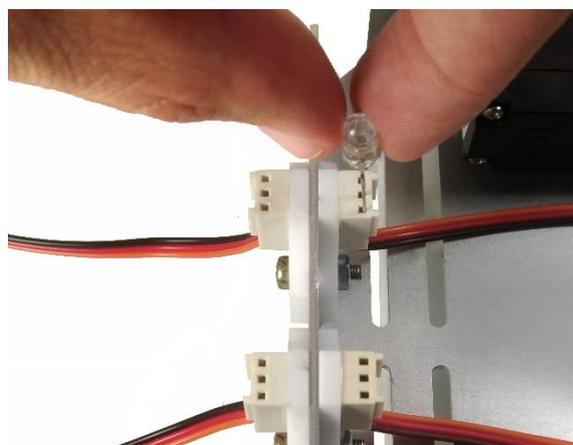


Figura 9.11 - Montando os foto resistores dentro dos suportes para LED.

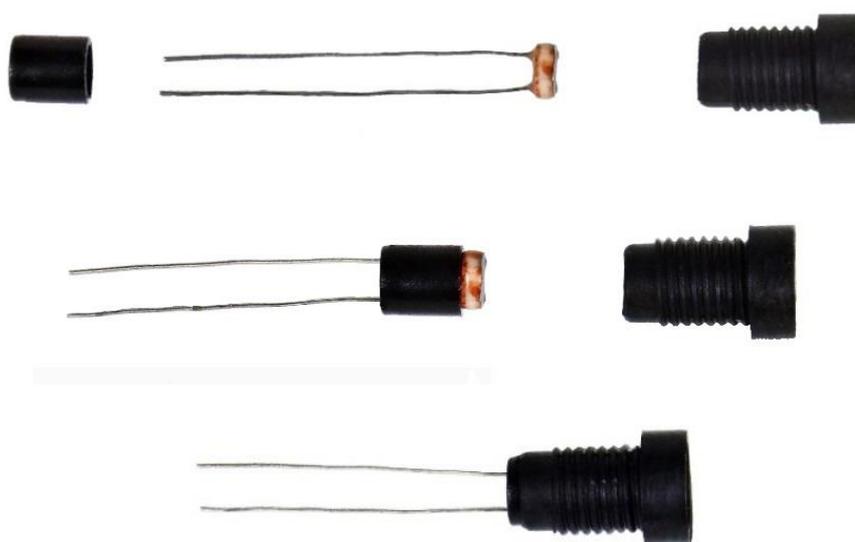


Figura 9.12 - Conectando os foto resistores nos cabos extensores.

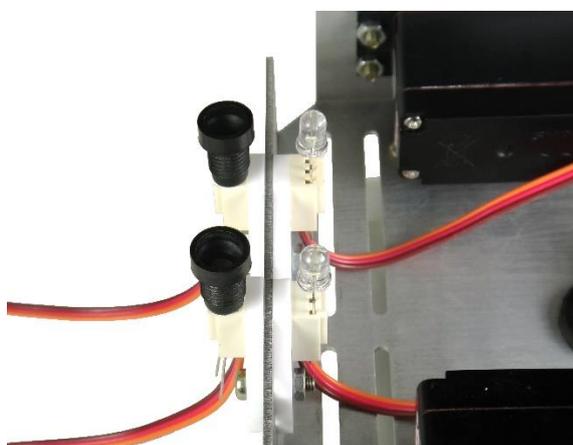
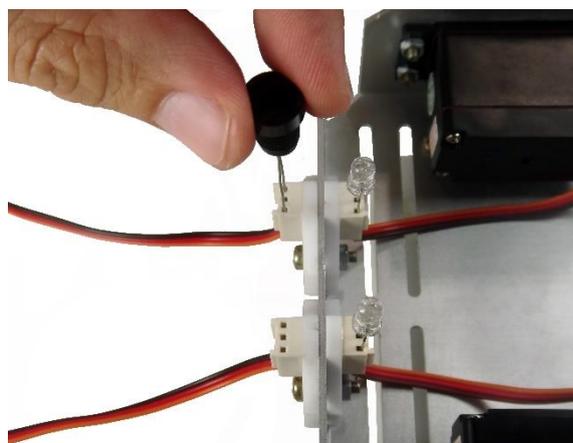


Figura 9.13 - Ligando os cabos extensores na protoboard.

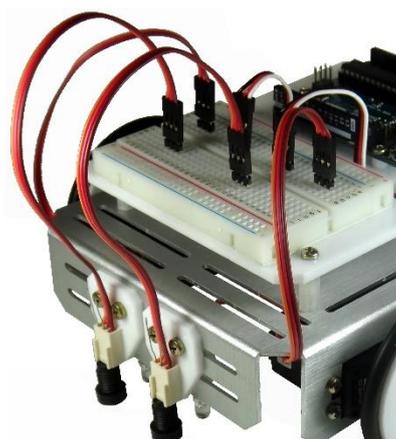


Figura 9.14 - Robô pronto para a realização da atividade.

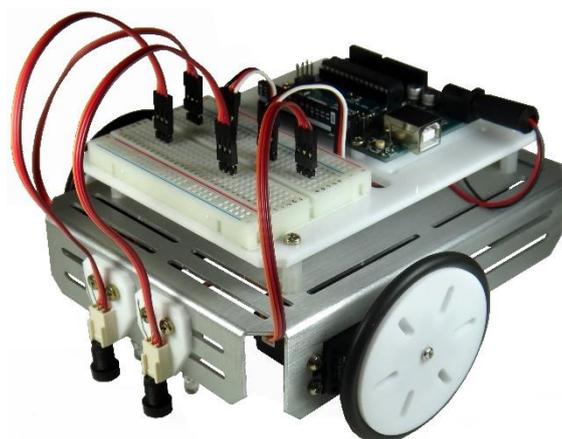
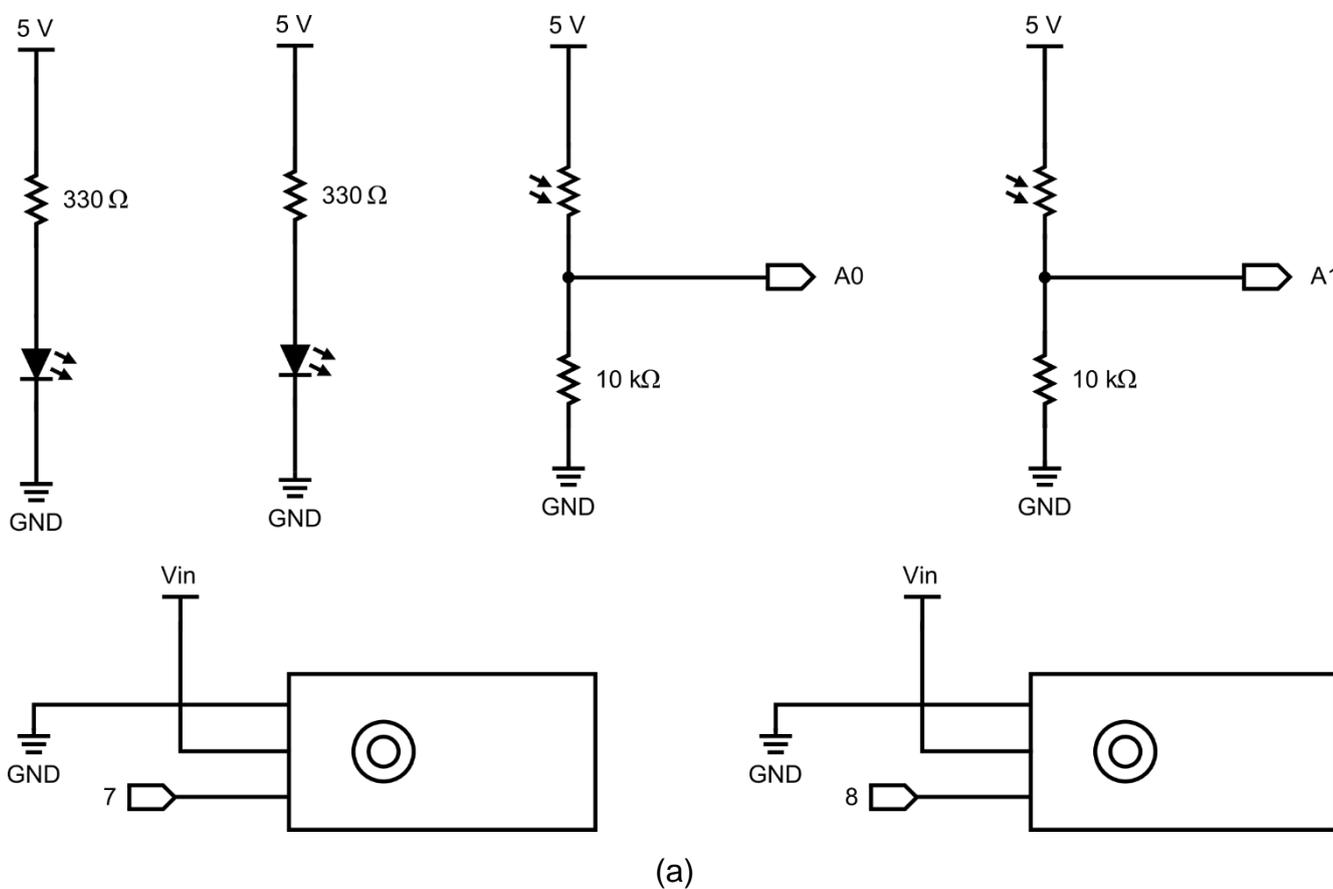
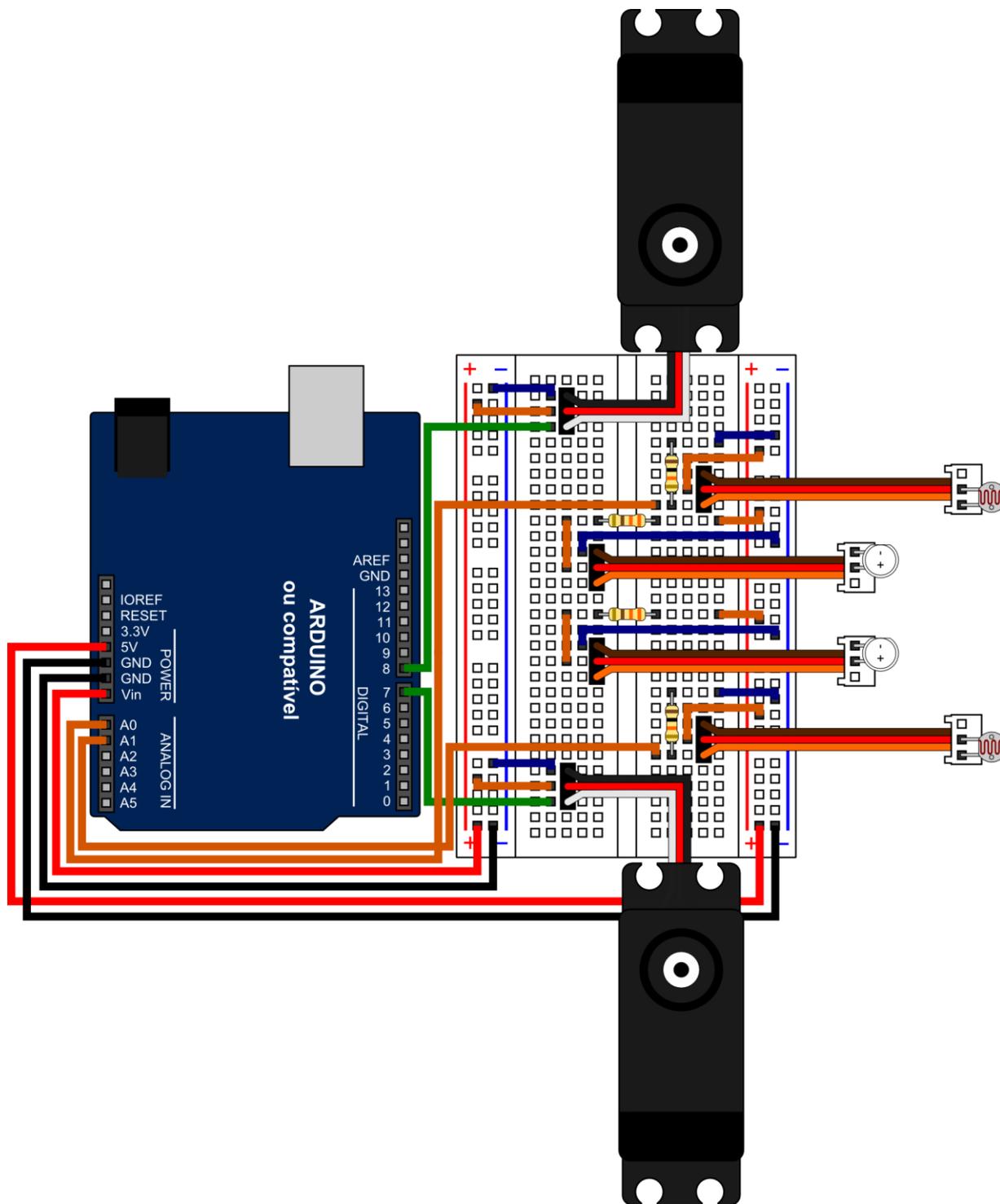


Figura 9.15 - (a) Esquema e (b) ilustração do circuito eletrônico da Atividade 31.





(b)

Figura A.1 - Tensões elétrica existentes nos pinos da placa Arduino.

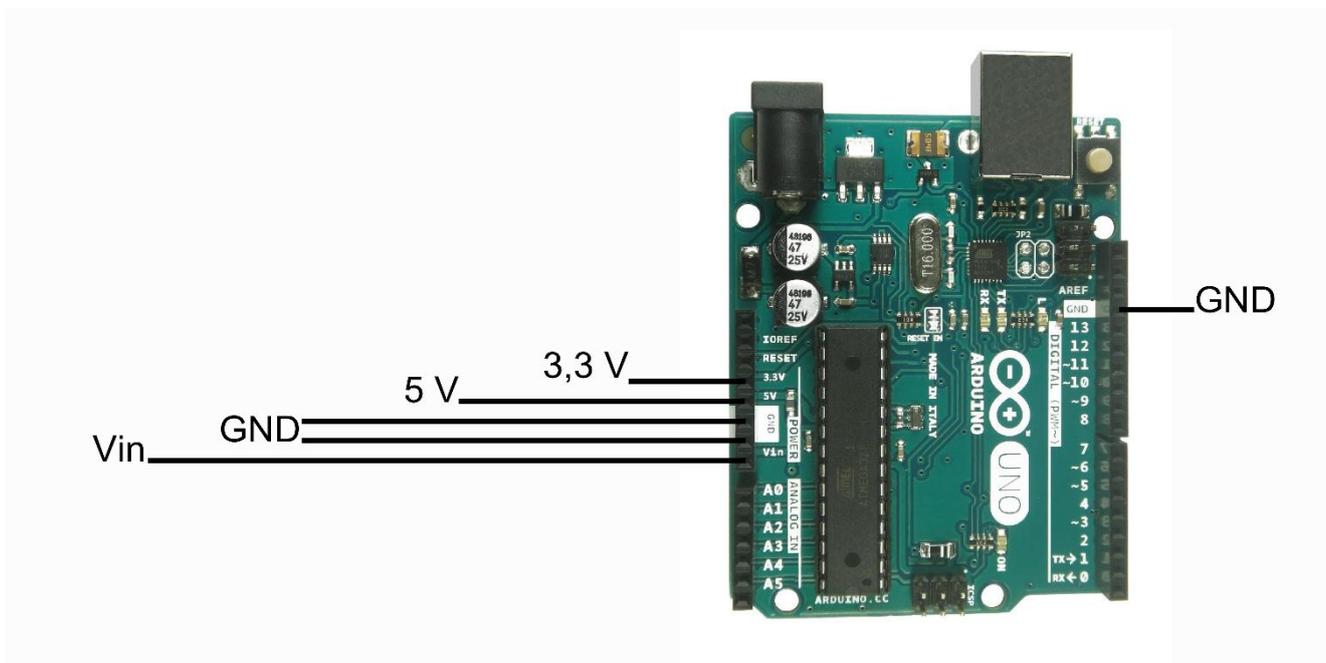


Figura A.2 - Circuito eletrônico da Atividade 1 (Capítulo 2).

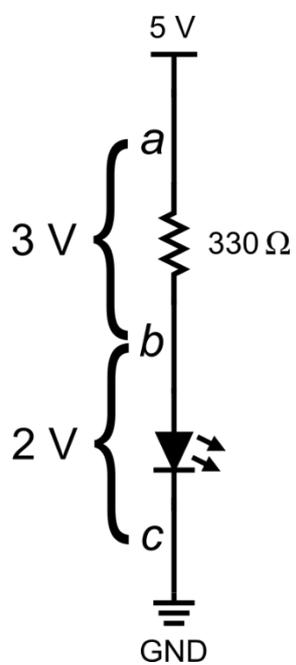


Figura A.3 - LED diretamente polarizado.

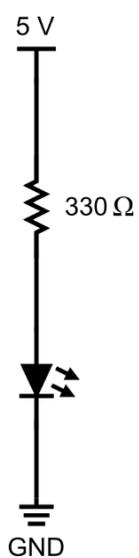


Figura A.4 - LED reversamente polarizado.

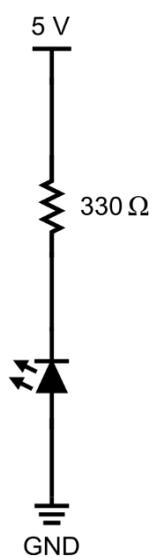
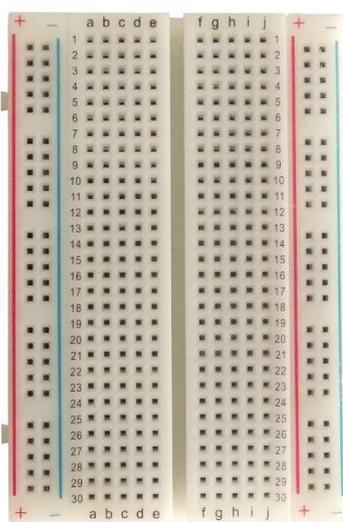
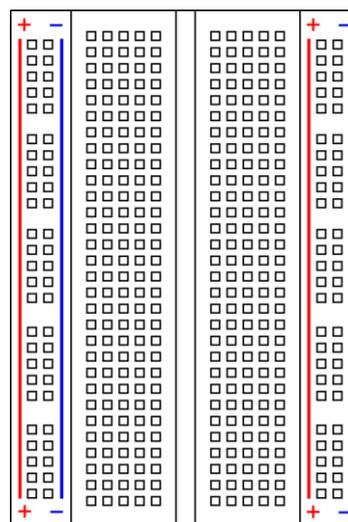


Figura B.1 - (a) Imagem de uma protoboard e (b) a figura que a representa na ilustração dos circuitos montados.

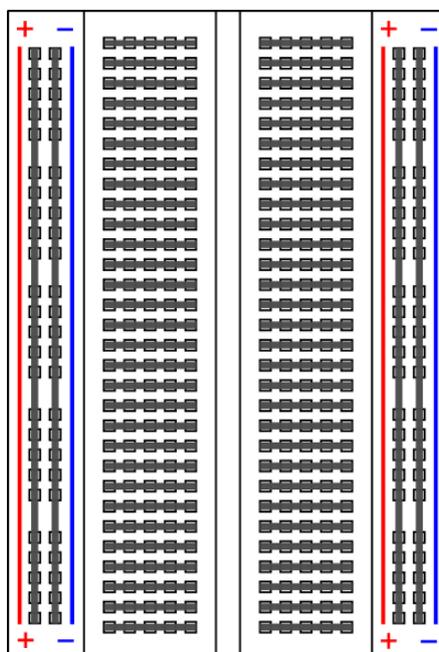


(a)

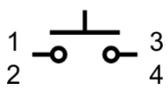
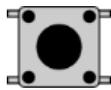
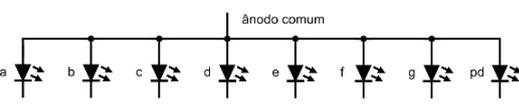
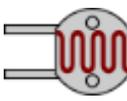
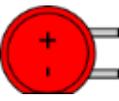
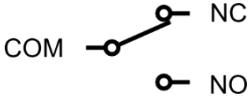
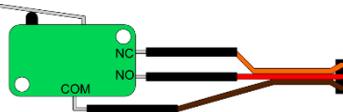


(b)

Figura B.2 - Forma como estão interligados os furos da protoboard.



## APÊNDICE C – SÍMBOLOS UTILIZADOS NOS CIRCUITOS ELETRÔNICOS

Elemento	Representação nos esquemas dos circuitos	Representação nas ilustrações dos circuitos
Arduino Uno	sem representação	
Cabo extensor	sem representação	
Chave táctil (pushbutton)		
Display de 7 segmentos		
Fio <sup>(1)</sup>	sem representação	
Foto resistor (LDR)		
LED <sup>(2)</sup>		
Micro chave		

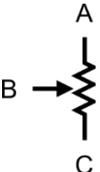
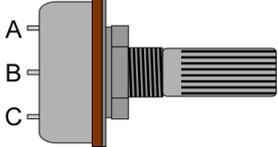
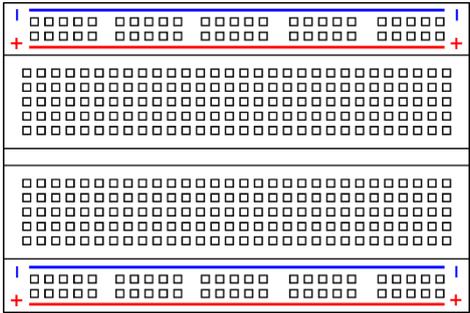
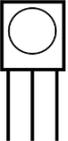
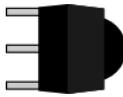
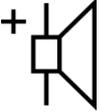
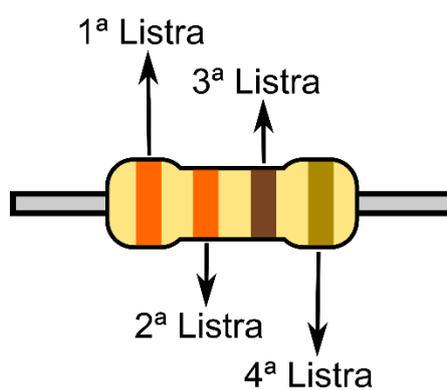
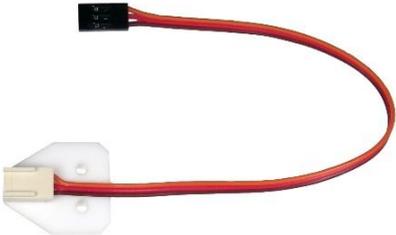
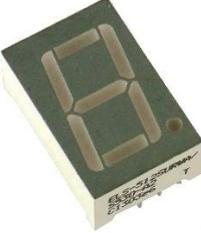
<p>Potenciômetro</p>		
<p>Protoboard (matriz de contatos)</p>	<p>sem representação</p>	
<p>Receptor de infravermelho</p>		
<p>Resistor<sup>(3)</sup></p>		
<p>Servomotor</p>		
<p>Sonorizador piezo (buzzer)</p>		

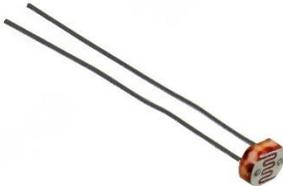
Figura E.1 - Resistor

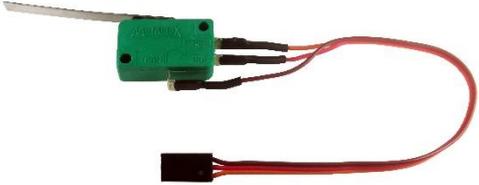


## APÊNDICE F – ITENS QUE COMPÕEM O KIT CRIATECNO CT100

Item	Imagem
Arduino Uno	
Arruela M3	
Barra de pinos	
Base de prototipagem	
Cabo extensor	

Cabo USB	
Chassi	
Chave táctil	
Display de 7 segmentos	
Eixo da esfera	
Esfera	
Espaçador 3 mm	

<p>Espaçador 15 mm</p>	
<p>Fio rígido<sup>(1)</sup> 8 cm</p>	
<p>Fio rígido<sup>(1)</sup> 12 cm</p>	
<p>Fio rígido<sup>(1)</sup> 15 cm</p>	
<p>Foto resistor</p>	
<p>LED amarelo</p>	
<p>LED branco</p>	
<p>LED infravermelho</p>	
<p>LED verde</p>	

LED vermelho	
Micro chave	
O-ring	
Parafuso M2,5 x 10mm	
Parafuso M3 x 8mm	
Parafuso M3 x 12mm	
Parafuso M3 x 16mm	
Porca M2,5	
Porca M3	

Potenciômetro	
Receptor de infravermelho	
Resistor 220 $\Omega$	
Resistor 330 $\Omega$	
Resistor 1 k $\Omega$	
Resistor 10 k $\Omega$	
Roda	

Servomotor <sup>(2)</sup>	
Sonorizador	
Suporte de pilhas	
Suporte curto	
Suporte longo	
Suporte em L	
Suporte para LED	