Simple NodeMCU 18 DOF Hexapod

by MusaW

A hexabot robot is a mechanical vehicle that walks on six
legs. Since a robot can be statically stable on three or more legs, a hexabot robot has a great deal of flexibility in how it can move. If legs become disabled, the robot may still be able to walk. Furthermore, not all of the robot's legs are needed for stability; other legs are free to reach new foot placements or manipulate a payload.

Many hexabot robots are biologically inspired by Hexabot locomotion. Hexabots may be used to test biological theories about insect locomotion, motor control, and neurobiology.

Using 18 servos or 18DOF with 3 join per leg is flexible enough for a hexabot robot than 12DOF hexabot robot.

some of Hexabot hobot have a complex mechanism and schematic. in this design i try to make a simple design hexabot using common component that we can found in the market
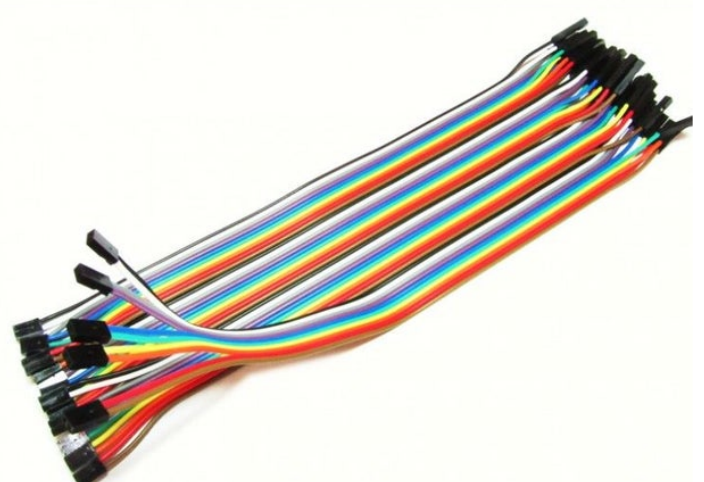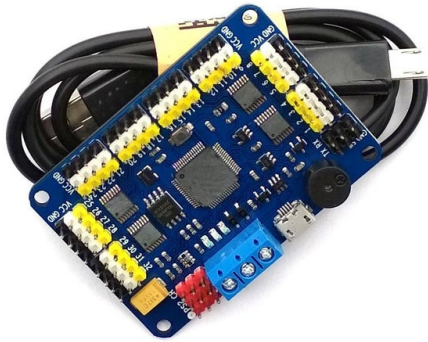
https://www.youtube.com/watch?v=hLO2kaVNZDE

Step 1: Time to Shoping

This all the component u need to buy:

1. 32 CH servo controller
2. Wemos D1 Mini
3. Servo servo tower pro 9g
4. 5v Ubec 6A minimal
5. mini DC-DC Step down converter
6. Female - female dupont cable jumper
7. Power module

Step 2: Print and Assemble the Body Part

all the spider body part and claw can be download from

https://www.myminifactory.com/object/3d-print-7650...
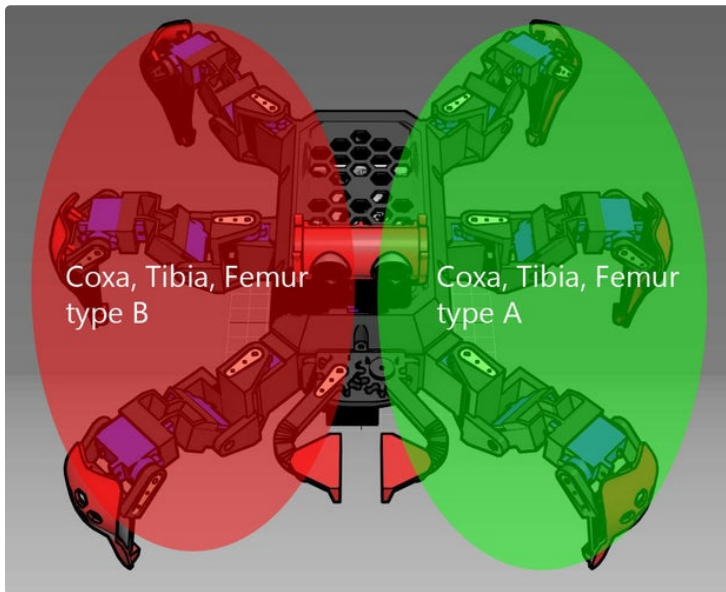
or

https://www.thingiverse.com/thing:3130196

mandatory list of part u have to print :

- 6x shield.stl
- 3x coxa_A.stl
- 3x coxa_B.stl
- 3x tibia_A.stl
- 3x tibia_B.stl
- 3x femur_A.stl
- 3x femur_B.stl
- 1x Hex_body_short.stl
- 1x Hex_cover_short.stl
- 1x Ring.stl

The rest is optional...

https://www.youtube.com/watch?v=MghVJJpN82w
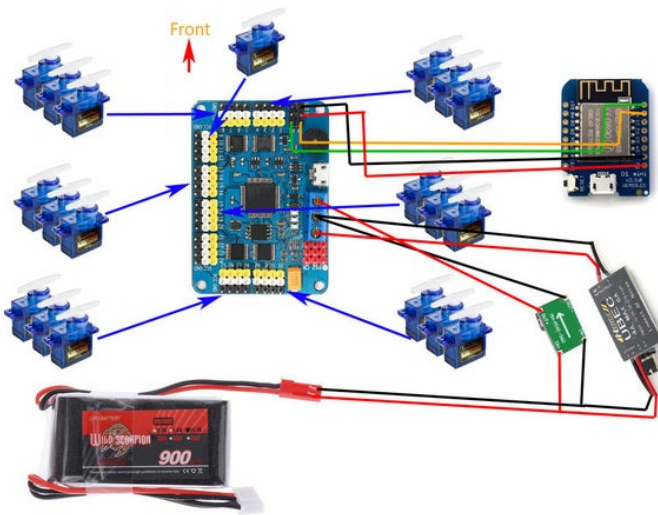
Coxa, Tibia, Femur type B

Coxa, Tibia, Femur type A

Step 3: Connecting the Dot

This is all electronic schematic, basically all servos controlled by 32CH servo controller because it's already have micro controller in it. Just like arduino it's independence and can controlled using serial command from PS2 controller, PC or other device.
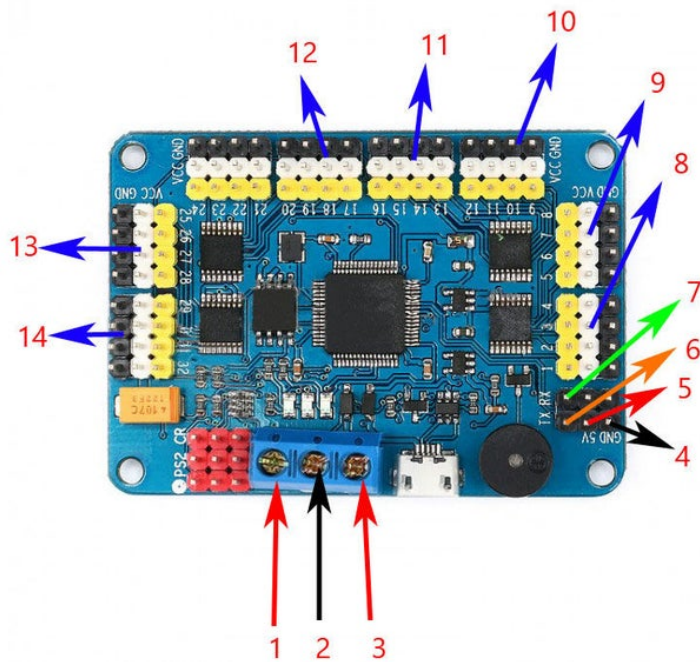

Step 4: 32CH Servo Controller

Features:

- Operating voltage: 5v
- Servo motor input voltage: 4.2V~7.2V

- CPU: 32 bit
- Baud Rate (USB):115200
- Baud Rate (bluetooth/UART): 4800 9600 19200 38400 57600 115200
- flash storage capacity: 16M
- Red Indicator: CPU power indicator
- Gree Indicator: servo motor indicator
- Yellow Indicator: PS2 Wireless Controller
- Mode Protocol: UART
- Computer protocol: Support Single
- Operating protocol: Support
- Supper servo motor type: 9G~55G (3.3V~7.2V)
- Online Operations Support: C51/ARM/DSP/Buletooth/Computer
- Mode type: USB/UART/Offline Independent/PS2 wireless control

Cabling mapping :

1. 5v power out (+) from UBEC
2. Ground from UBEC and Mini Stepdown
3. 5v power out (+) from mini step down
4. to Wemos D1 mini G pin
5. to Wemos D1 mini 5v pin
6. to Wemos D1 mini RX pin
7. to Wemos D1 mini TX pin
8. (match the pin color with the servo cable color) to **right front leg** (pin 1 to coxa, pin 2 to femur, pin 3 tibia servo)
9. (match the pin color with the servo cable color) to **left front leg** (pin 5 to coxa, pin 6 to femur, pin 7 tibia servo)

10. (match the pin color with the servo cable color) pin 9 to claw servos (assemble the claw first)

11. (match the pin color with the servo cable color) to **left middle leg** (pin 13 to coxa, pin 14 to femur, pin 15 tibia servo)

12. (match the pin color with the servo cable color) to **right middle leg** (pin 17 to coxa, pin 18 to femur, pin 19 tibia servo)

13. (match the pin color with the servo cable color) to **left back leg** (pin 25 to coxa, pin 26 to femur, pin 27 tibia servo)

14. (match the pin color with the servo cable color) to **right back leg** (pin 29 to coxa, pin 30 to femur, pin 31 tibia servo)

Step 5: NodeMCU AP

The WeMos D1 mini is minimal ESP8266 wifi board

Using wemos D1 mini as WIFI AP we can send serial command to the 32 CH servo controller and independence become Web server AP for controlling the robot.

all we need just flash the nodeMCU board with the code attach and we can connect the smartphone to the nodeMCU AP and using web browser open http://192.168.4.1 and we can see all the command.

ModeMCU Pin mapping:

1. to the 32 CH servo controller RX pin
2. to the 32 CH servo controller TX pin
3. from 32 CH servo controller G pin
4. from 32 CH servo controller 5v pin

PS: I have fix (31/4/2019 update) some connection issue that appears before... such as hard to connect or page not render completely...and if u have a alot of error movement, please check your battery current... usually it because it running with not enough battery power...

***So Have some fun with it...!! :)***
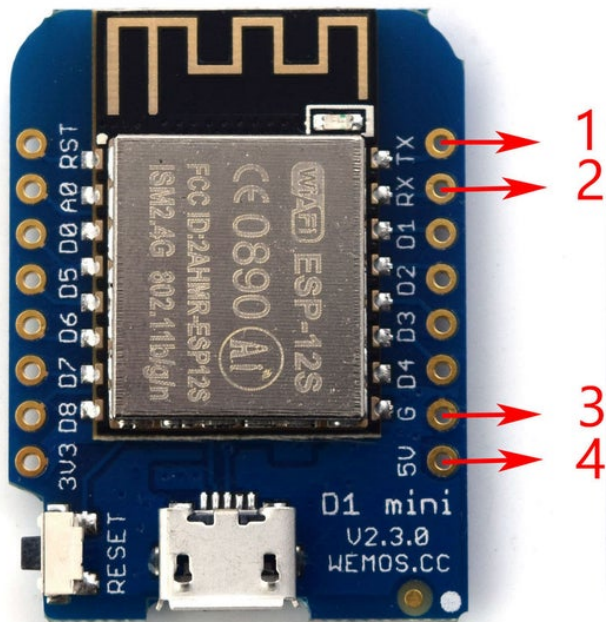
Step 6: Initial Pose

IMPORTANT...!!

we need to set the initial pose for the spider.

1. turn on the robot (at the first time maybe all the leg will be miss pose so for this step please release all the servo horn first)
2. reattach the servo horn and adjust the coca, tibia and femur pose just like the picture abbove
3. turn off and turn on again to make sure that all leg is in the right position
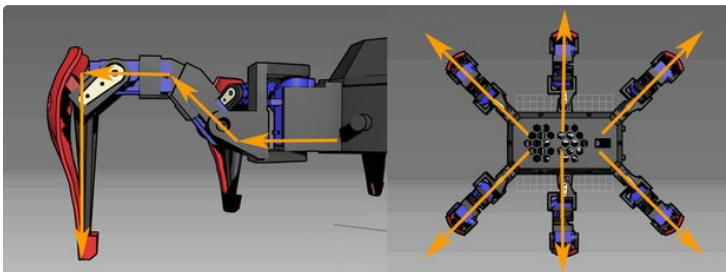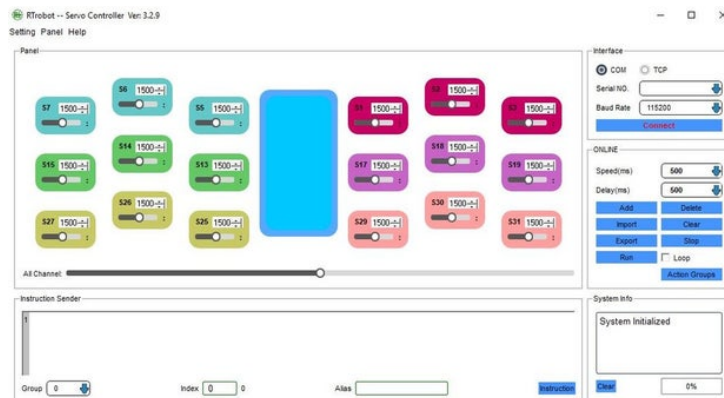
Step 7: Adding More Movement

After all finish, we can add more motion to the arduino code. I using RTrobot servo controller to make some movement and after we have the serial command for the servo, we can put it in the code with some code adjustment.

download here

or here @4shared for windows & linux only

PS Very very IMPORTANT :

all RX and TX from and to Wemos and Servo Drivers have to firmly connected, because looping routine always check **"OK respond"** from the 32 servo drivers. If servo driver not found and there is no **"OK"** respond, than program will be loop in **"void the wait_serial_return_ok()"**
This mistake will cause : - Cannot connect to the AP - Blank web page - Page loading progress not finish

Step 8: Sugestion...

1. for power supply we also can use lipo 3s battery, i think 900mah is enough but u need to have lipo battery for charge it.
2. if u want to put obstacle sensor and servos, u can connect the sensor to the one of the wemos d1 mini input pin, and the power from 32 CH servo controller G and 5V
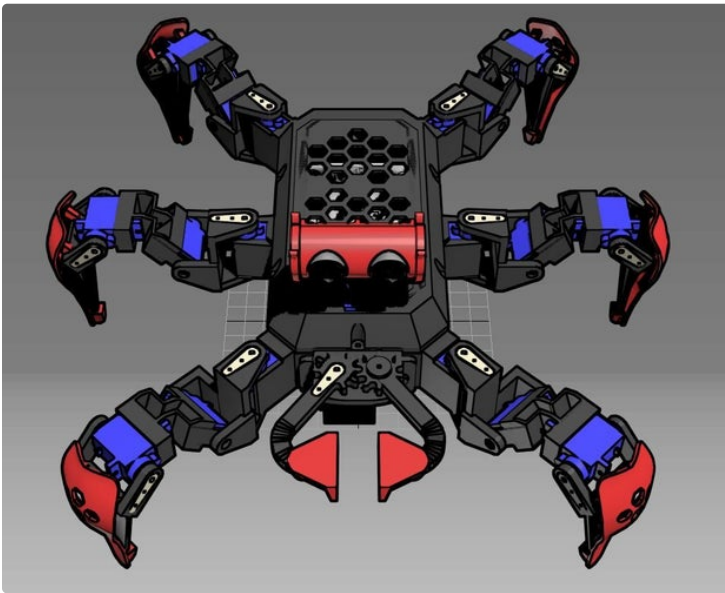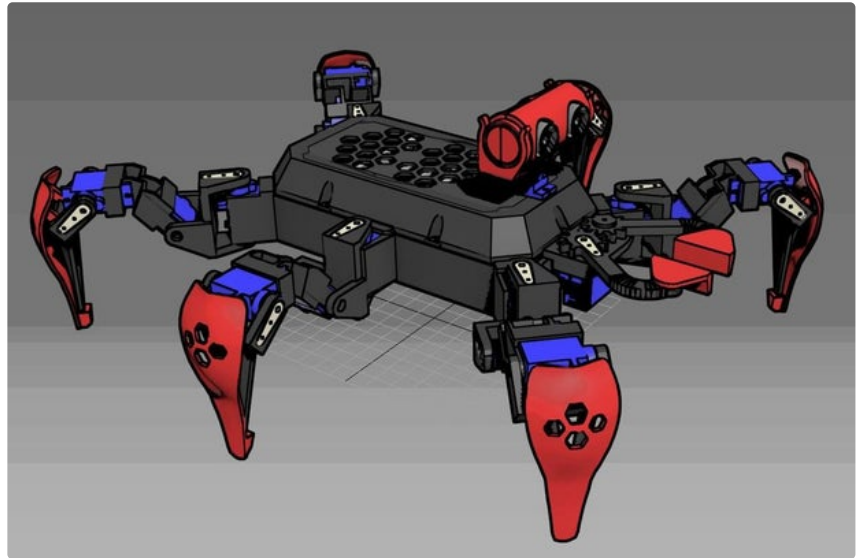
Step 9: For Whom Have a Problem With Opening Web Page or Connecting to the AP

I HAVE FIX THIS ISSUE PLEASE DOWNLOAD IT AGAIN FROM STEP 5 ABOVE (fix @ 31-4-2019)
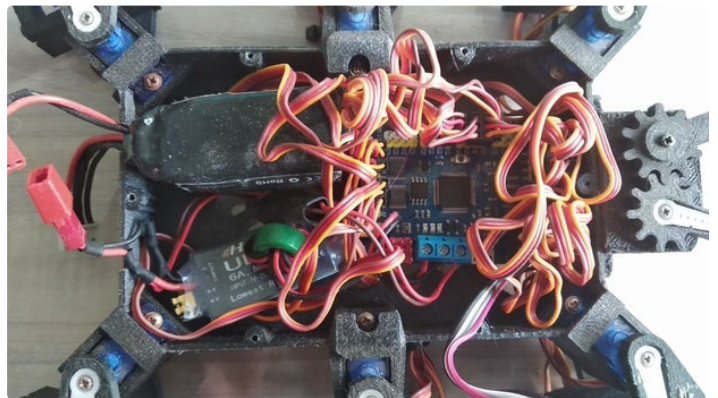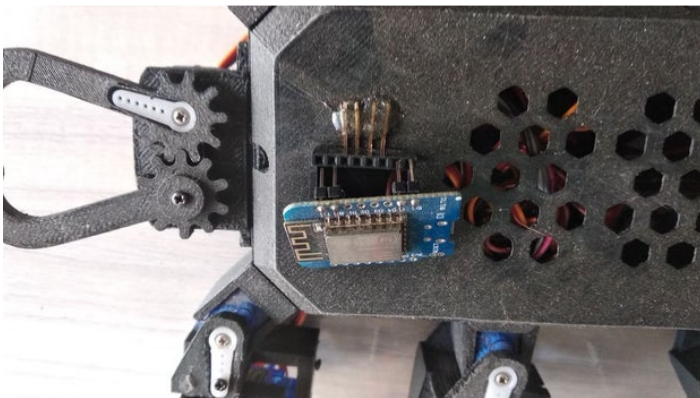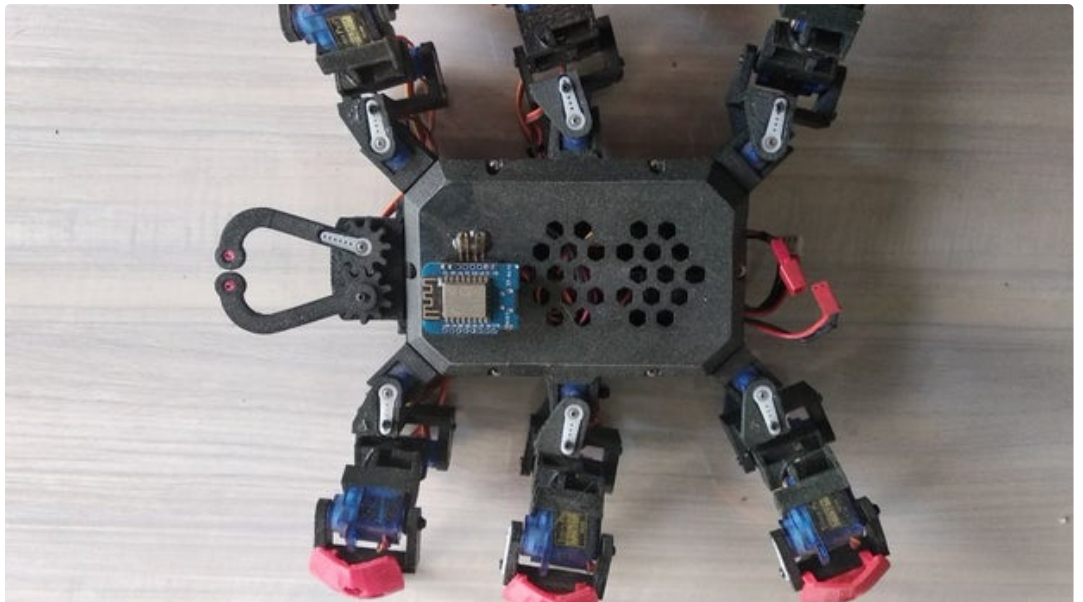
some of Wemos D1 mini clone have a bad or defect ESP, and it causing:

- Hard to connect to the AP

- Fail to open page

- Loading not finish

For more detail check my video above...

Step 10: Cable Organize...

Basically just do the u can do... But I can share I I have do... Here's the picture...

Great work! :)... I wanna make this too... but I have problem with printing parts ...:(... I dont know when I can finish it

i have another project that's more easy to print soon

pleaaase :)))

this is the sneak peek https://www.youtube.com/watch?v=fXPQleNFTyA

you have great ideas. But the spider/hexapod still doesn't work ... I'll be waiting for your new project

https://www.instructables.com/id/Hex-Robo-V1/

MusaW, thanks for this instructable, my hexapod has been running using my existing raspberry, just porting your code to python..

superb, if u mind maybe u can share that py code too...

of course, here is the code..

Thank you for helping the others... :)

Hello. I have a problem with connecting to the AP. I'm going to upload the program pretty well to wemos. But if I connect with my smartphone and press a command, the AP stopped ... why? Servo board is well, servos too,... but communication between board=wemos=smartphone... no ... :(i tried cables and others... and nothing :/

do u separate between servo driver power and nodemcu board power?

yes, everything has divided power. I even bought another servo board for sure if the previous one was damaged. But there's nothing wrong with that either.

I can occupy a normal nodemcu (https://cdn-tienda.bricogeek.com/4389-thickbox_default/nodemcu-v3-esp8266.jpg), without being mini ??, since I perform all the steps as indicated and the result is completely different, the servomotors are contracted when receiving the power of the battery, what can I do?

i never try that mcu

I am a beginner. Can I use the usc ver7.70 servo controller?

i think u can

Nice project. I had some problems about serial speed, It didn't work at 115200, I think maybe because quality of hardware????

Thank you for your sharing...I have problem with installing driver servo controller 32 ch ver 3.1...could you send me software & driver for servo controller because link download from http://rtrobot.org/software/ given by seller was broken

I have tried your suggestions and I still have the same issue. To clarify if I upload the Quadruped program I am able to connect to the Wemos and the web-page for the Quadruped control loads. When I upload the Hexapod program I am able to connect to the Wemos but when I put in the address nothing loads. Is this the same issue you where having because I have tried your suggestion on 3 different Wemos boards and they all have the same end result.

Thank you

i have fix the issue, please download it and flash it the wemos again (update 31/3/2019)

all RX and TX from and to Wemos and Servo Drivers have to firmly connected, because looping routine always check **"OK respond"** from the 32 servo drivers. If servo driver not found and there is no "OK" respond, than program will be loop in **"void the wait_serial_return_ok()"**

This mistake will cause :
- Cannot connect to the AP
- Blank web page
- Page loading progress not finish

i think your wemos is broke... because i have same experience like that too with wemos, and i have to replace the wemos with a new one...

Hello

With the ino code of the quadrupede, the web page appears correctly.

WITH THE INO PROGRAM OF HEXAPODE, the web page does not appear.

this is tested on three different Wemos.

What's the problem

Thank you

i have fix the issue, please download it and flash it the wemos again (update 31/3/2019)

in hexapod u have to connect RX and TX pin corectly because there's some looping routine that's checking feed back from servo driver, that's feedback indicates that the all servos has reach the position.
the respond that's wemos waiting is "OK" feedback, if the wemos not receiving "OK" feedback than the wemos will continue waiting...

Merci

Hi
Is there any difference between usc32 controller and ssc32 controller?
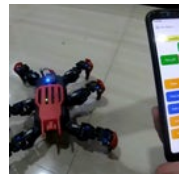I'm getting the output in serial monitor but the hexapod is not moving.

maybe u can read the data sheet first, look for the move command... if there is a different with my command u can adjust it...

this in my second robot project after quadruped

Hi there
How did you manage to upload the sketch? No matter what I do there's always a file missing. What board did you chose? How did you go past the missing files?

Hello
I found several errors in stl files, please, look at them and update if I'm right:
Base-body, bae-body-claw: there is no mount place at a right middle leg

Cover-sonar: there is no all mounting places
No sonar body stl files found
And thank you for an interesting project!

this project is basicaly still on progress, i'll be happy if u want to remix some of it and fix it...
because maybe i still don't have time to finish it soon enought...

MusaW,
Thanks again for all your help. I am still waiting to receive my servo driver board so obviously since
it is not connected that is why I cannot get the webpage to display. I missed that part of the code
that checks for the connection of the servo board.

u re welcome

Hello

I am a beginner, could you tell me how to send the code HexapodAP_BasicMove_R20181012.ino
and especially on which card.

big thanks

check this video https://www.youtube.com/watch?v=q2k3CzT5qE0