# Actuators

## Team: Los simuladores

### Types of comercial actuators

# Development

1. Use the following list of comercial electric actuators models for the development of the activity based on the instructions requested by the advisor.
    - ☐ Double axis gear motor
    - ☑ Unipolar stepper motor
    - ☐ Bipolar stepper motor
    - ☐ SG90 model servo motor
2. Wait for the advisor to indicate the type of sensor that your team will develop and once you have it mark the sensor within the previous point.
3. Once you know the topic to be developed, research and write following points within this document :

# Engineering in Computer Systems, Information and Communication Technologies and Computing

## Subject: SCC-1023/SC7A Programmable Systems

## Team Members

| Name | Control Number |
|---|---|
| Garcia Posada David | C18211918 |

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| Oscar Alonso Rojas Ceballos | 18212262 |
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## Adviser: Jaime Leonardo Enriquez Alvarez


## Date: May 04, 2021

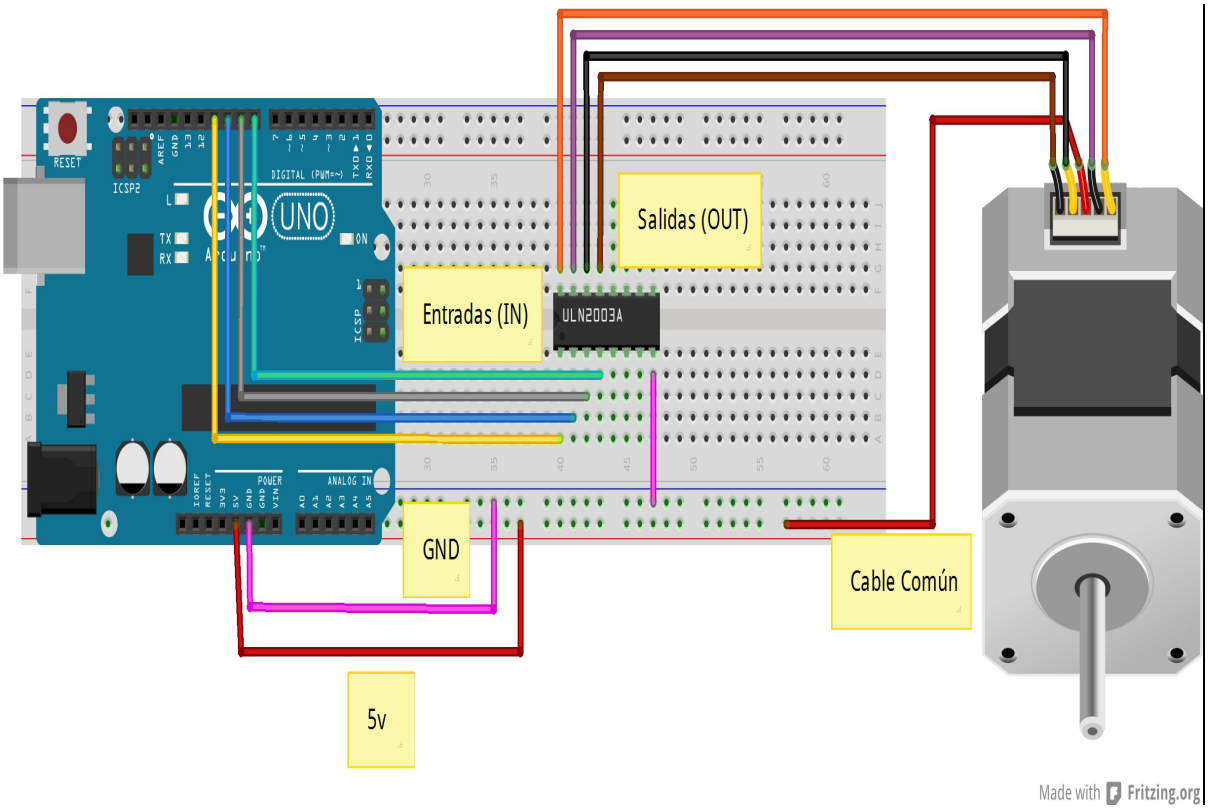
- **Introduction**
  Stepper motors are very useful motors since they allow to control very precisely the movement of the motor and the number of degrees that it moves. making it of great importance in jobs that require greater precision, on this occasion we will talk about its simplest model, the unipolar stepper motor that stands out for maintaining that high precision of the stepper motors but also being easier to use that other motors of this type

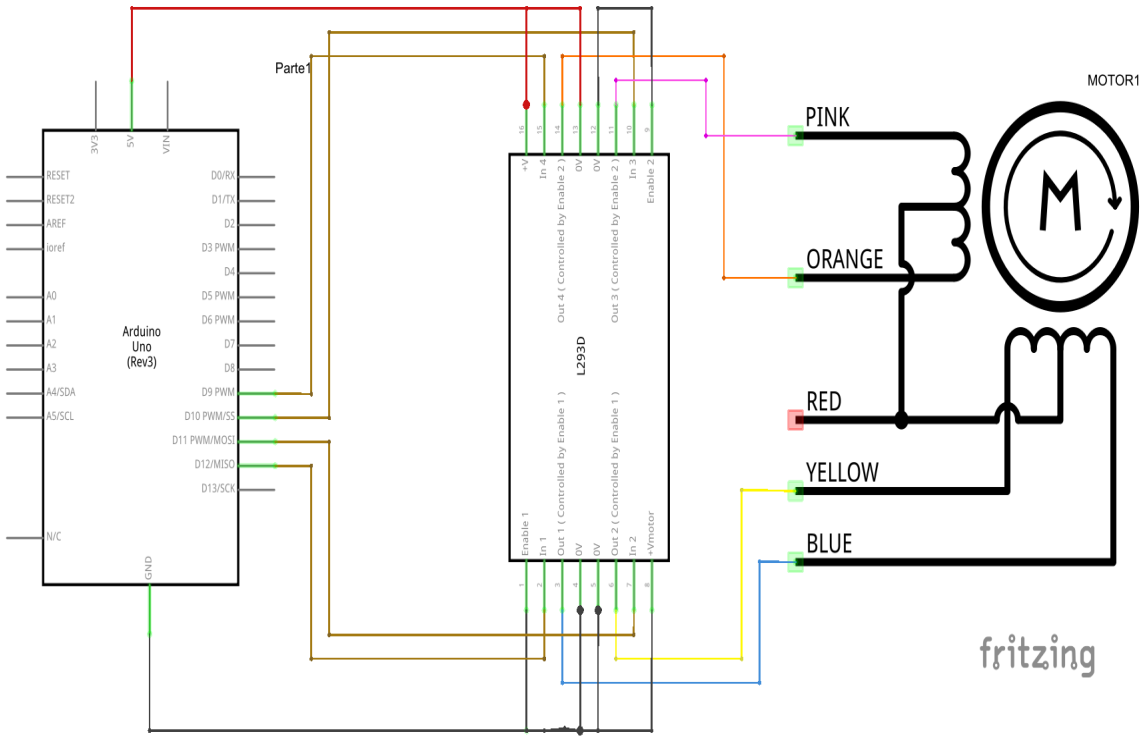
- **Development**

  - **Definition**. The unipolar stepper motor is a stepper type motor, which means that when a voltage is applied to it, this one moves a certain number of angles transforming electrical impulses into controlled rotational movements.
    This specific type of motor is the unipolar one that is easier to control and only allows current to pass in one direction

  - **Images** from the actuator.


Φ=8mm
Φ=54mm
23mm
Φ=4.5mm


Salidas (OUT)
Entradas (IN)
ULN2003A
GND
Cable Común
5v
Made with Fritzing.org




- **Physical** properties.

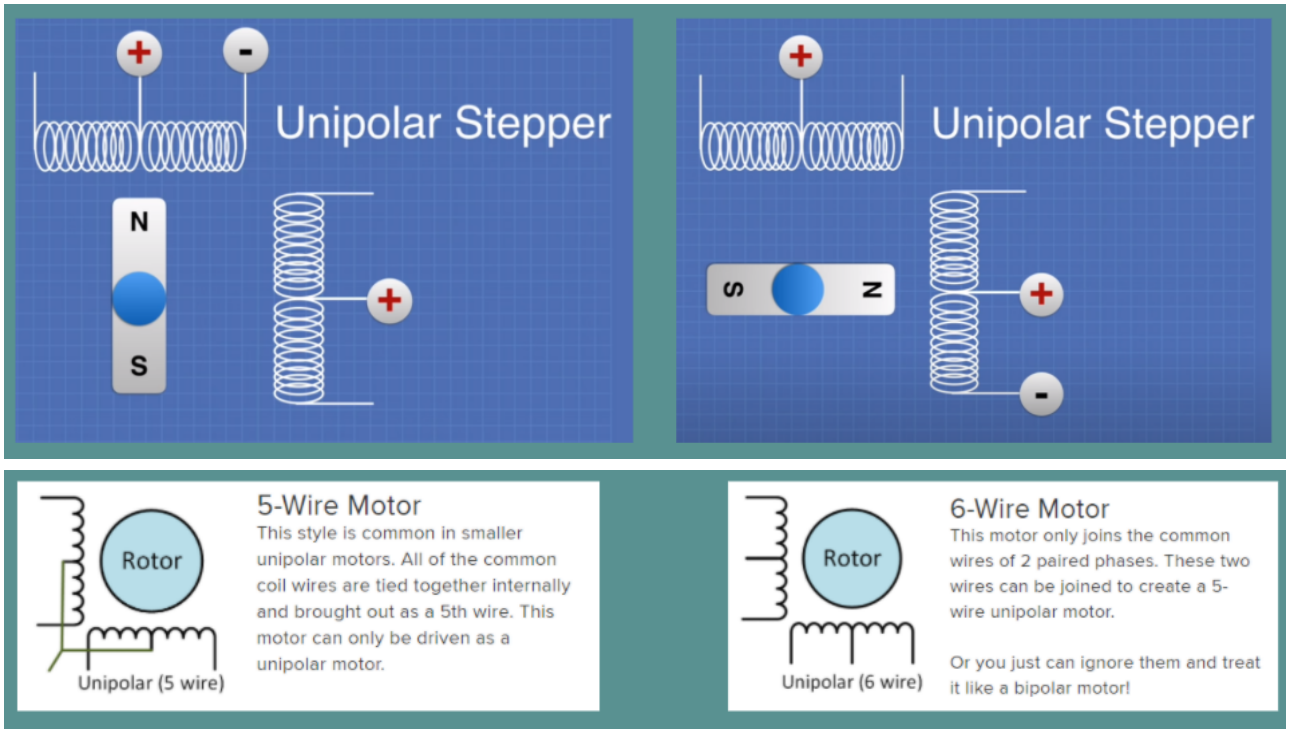
| Property | Quantity |
|---|---|
| Steps per rotation | 20, 24, 40, 48, 100, 200 |
| Grades per step | 18°, 15°, 9°, 7.5°, 3.6°, 1.8° |
| Plastic magnet | --- |
| Operating temperature | -10 to 50 C° |
| Storage temperature | -30 to 80 C° |
| Operating humedity | 20% RH a 90% RH |
| Pines | 5, 6 , 8 |
| Internal coils | 4 |

- **Electrical** properties.

| Property | Quantity |
|---|---|
| Average amperage | 800 mA |
| Voltage | 5V to 28 V |
| Insulation resistance | 100 Mohms |
| Coil resistance | 30 ohms |
| Dielectric strength | 500V/1Min |

- **Explain the principle of operation**

  The unipolar stepper motor operates with one winding with a center tap per phase. Each section of the winding is switched on for each direction of the magnetic field. Each winding is made relatvely simple with the commutation circuit, this is donde since the arrangement has magnetic pole wich can be reversed without switching the direction of the current.



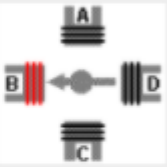

There are three possible sequences for this type of engines, which are detailed below. All sequences start again by step 1 after reaching the final step (4 or 8). To reverse the direction of rotation, simply run the sequences in reverse mode.

- Normal Sequence: This is the most used sequence and the one generally recommended by the manufacturer. With this sequence the engine advances one step at a time and because there are

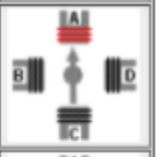
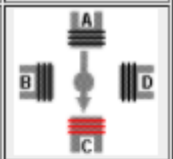
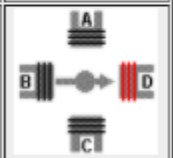
always at least two coils activated, you get a high pitch and hold torque.

| STEP | COIL A | COIL B | COIL C | COIL D | |
|---|---|---|---|---|---|
| 1 | ON | ON | OFF | OFF |  |
| 2 | OFF | ON | ON | OFF |  |
| 3 | OFF | OFF | ON | ON |  |
| 4 | ON | OFF | OFF | ON |  |

- Wave drive sequence: In this sequence only one coil is activated at a time. In some engines this provides smoother operation. The counterpart is that since only one coil is activated, the torque of step and retention is less.

| STEP | COIL A | COIL B | COIL C | COIL D | |
|---|---|---|---|---|---|
| 1 | ON | OFF | OFF | OFF |  |
| 2 | OFF | ON | OFF | OFF |  |
| 3 | OFF | OFF | ON | OFF |  |
| 4 | OFF | OFF | OFF | ON |  |

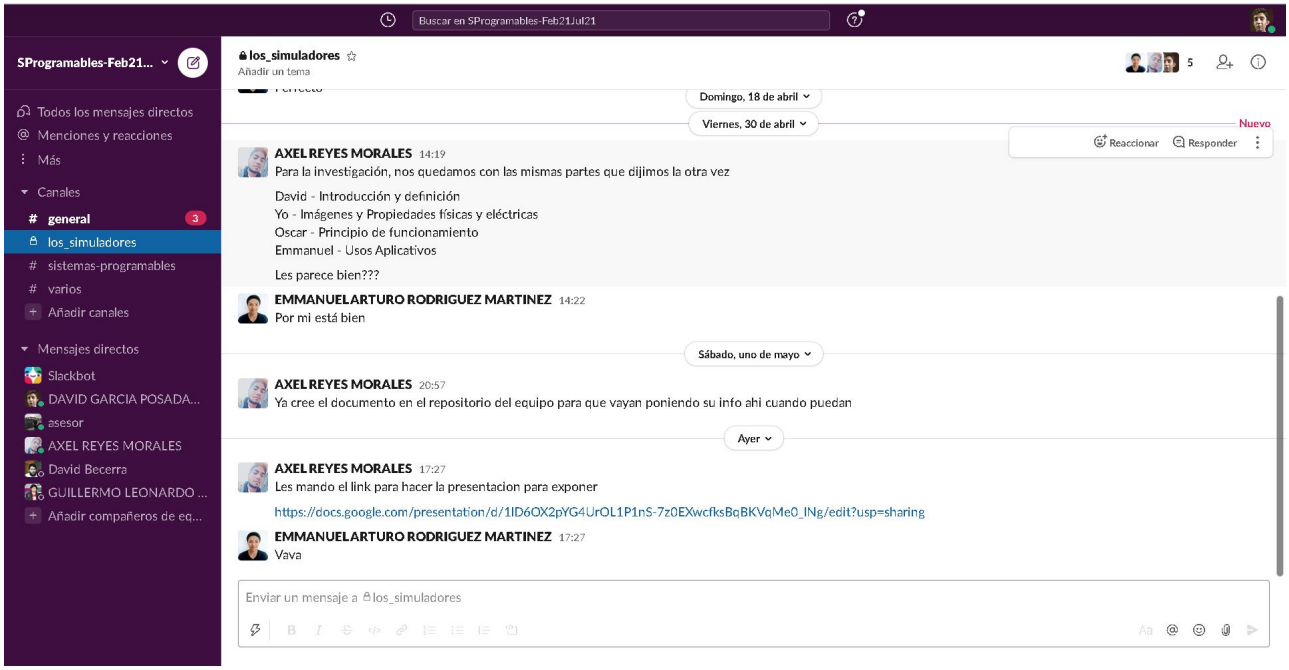
- Half-step sequence: In this sequence the coils are activated in such a way to provide a movement equal to half of the actual step. For this, 2 coils are activated first and then only 1 and so on. As we see in the table the entire sequence consists of 8 moves instead of 4.

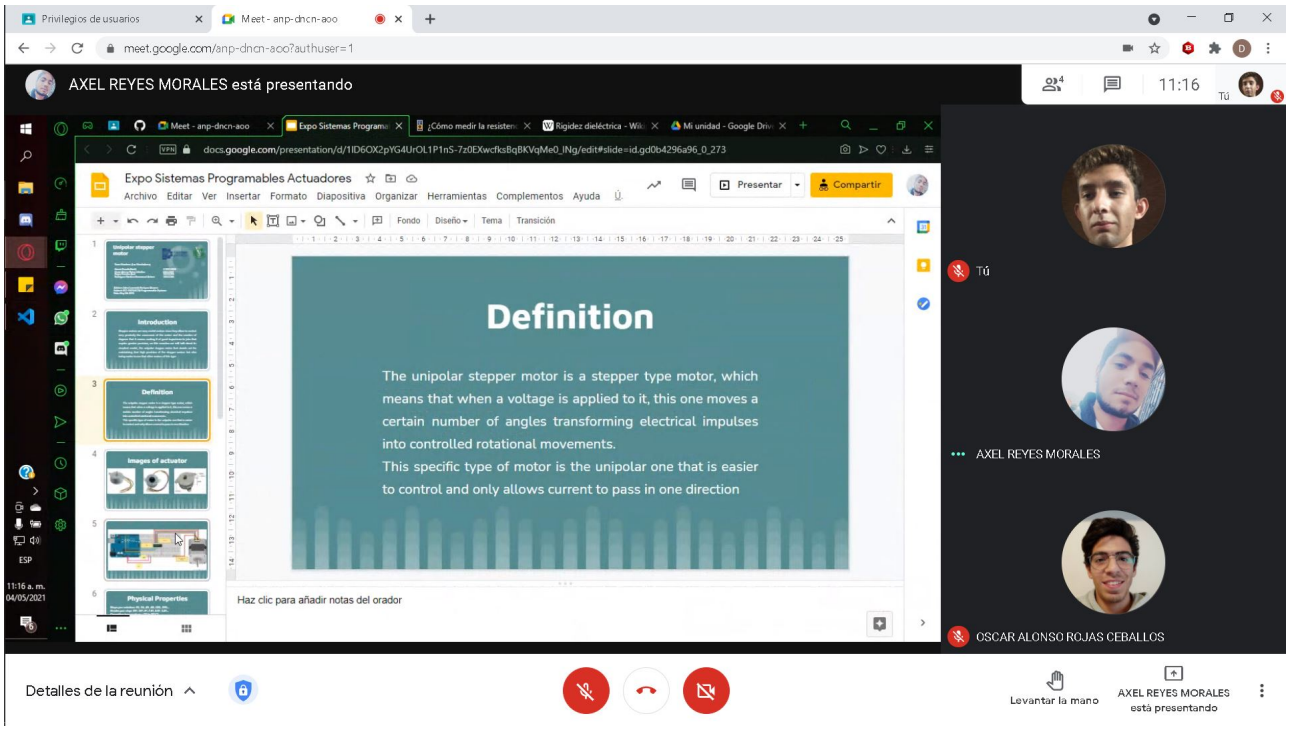
| STEP | COIL A | COIL B | COIL C | COIL D | |
|---|---|---|---|---|---|
| 1 | ON | OFF | OFF | OFF |  |
| 2 | ON | ON | OFF | OFF |  |
| 3 | OFF | ON | OFF | OFF |  |
| 4 | OFF | ON | ON | OFF |  |
| 5 | OFF | OFF | ON | OFF |  |
| 6 | OFF | OFF | ON | ON |  |
| 7 | OFF | OFF | OFF | ON |  |
| 8 | ON | OFF | OFF | ON |  |

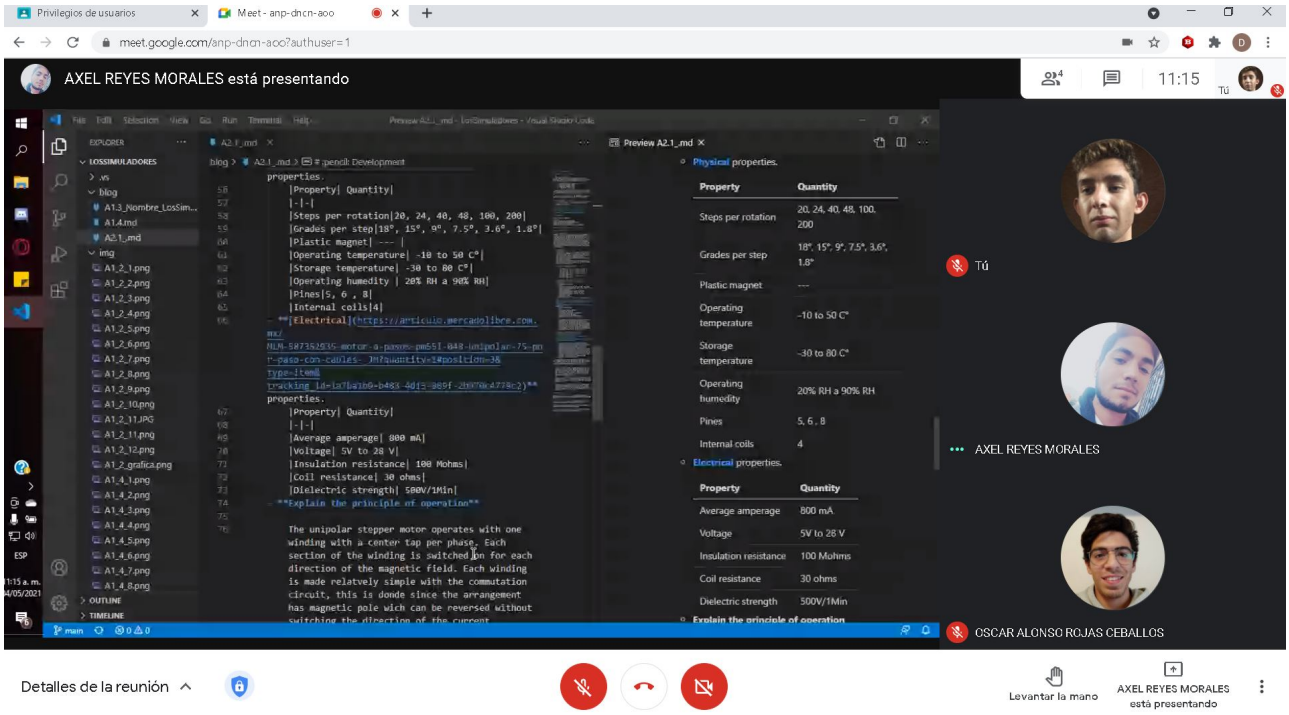
- **Aplicative** uses.

  They are mainly used in applications that require precise travel control, positioning devices, because it is easy to make the appropriate device and software using a computer and a controller. They are also widely used in biomedical appliances, computer disk drives, printers, scanners, smart lighting, to control camera lenses, the position of control elements in combustion engines, robotics, 3D printers and scanners, XY plotters, CNC machines. and other devices.

1. Insert images of evidence such as meetings of the team members held for the development of the activity.


Buscar en SProgramables-Feb21Jul21
SProgramables-Feb21...
Todos los mensajes directos
Menciones y reacciones
Más
Canales
general
los_simuladores
sistemas-programables
varios
Añadir canales
Mensajes directos
Slackbot
DAVID GARCIA POSADA...
asesor
AXEL REYES MORALES
David Becerra
GUILLERMO LEONARDO ...
Añadir compañeros de eq...
los_simuladores
Añadir un tema
Domingo, 18 de abril
Viernes, 30 de abril
Nuevo
Reaccionar
Responder
AXEL REYES MORALES 14:19
Para la investigación, nos quedamos con las mismas partes que dijimos la otra vez
David - Introducción y definición
Yo - Imágenes y Propiedades físicas y eléctricas
Oscar - Principio de funcionamiento
Emmanuel - Usos Aplicativos
Les parece bien???
EMMANUEL ARTURO RODRIGUEZ MARTINEZ 14:22
Por mi está bien
Sábado, uno de mayo
AXEL REYES MORALES 20:57
Ya cree el documento en el repositorio del equipo para que vayan poniendo su info ahi cuando puedan
Ayer
AXEL REYES MORALES 17:27
Les mando el link para hacer la presentacion para exponer
https://docs.google.com/presentation/d/1ID6OX2pYG4UrOL1P1nS-7z0EXwcfksBqBKVqMe0_INg/edit?usp=sharing
EMMANUEL ARTURO RODRIGUEZ MARTINEZ 17:27
Vava
Enviar un mensaje a los_simuladores


Privilegios de usuarios
Meet - anp-dncn-aoo
meet.google.com/anp-dncn-aoo?authuser=1
AXEL REYES MORALES está presentando
11:16
Tú
Expo Sistemas Programables Actuadores
Archivo Editar Ver Insertar Formato Diapositiva Organizar Herramientas Complementos Ayuda
Presentar
Compartir
Definition
The unipolar stepper motor is a stepper type motor, which means that when a voltage is applied to it, this one moves a certain number of angles transforming electrical impulses into controlled rotational movements.
This specific type of motor is the unipolar one that is easier to control and only allows current to pass in one direction
Haz clic para añadir notas del orador
Tú
AXEL REYES MORALES
OSCAR ALONSO ROJAS CEBALLOS
Detalles de la reunión
Levantar la mano
AXEL REYES MORALES está presentando




2. Include the individual conclusions and results observed during the development of the activity.

   **David:** The unipolar stepper motor is a great stepper motor to use when you are learning to use them for its great ease of use, mantaining almos all the advantages of the stepper motors with really only a few setbacks making it a grat options for begginers and experts alike

   **Axel:** To conclude I can say that these types of engines help us in circumstances where we occupy the engine moving slowly, or occupy a slow motion of the engine

   **Emmanuel** In conclusion, unipolar stepper motors work through magnets which make the motor rotate taking steps, this makes it possible to carry out jobs that need a lot of precision like that of a 3D printer.

   **Oscar Rojas** The unipolar stepper is a great solution for small project it is easy to use, cheap and you can use it as a bipolar stepper.

# Repositories

**Axel** Go to my repository

**David** Go to my repository

**Emmanuel** Go to my repository

**Oscar Rojas** Got to my repository