Manipulator Control Board

Socrates-Erasmus Project
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A robot is a mechanical device which performs its tasks either according to:

- Direct human control
- Partial control with human supervision
- Completely autonomously

The tasks they perform are:

- Difficult
- Dangerous
- Boring
THE ROBOTIC ARM...

...is the most common manufacturing robot.

A robot with 6 joints resembles a human arm.

Robots

A robot with 6 joints resembles a human arm.

Sorts of end effectors for robotic arms:

- Hand
- Blowtorches
- Drills
- Spray painters
MiniMover-5

STRUCTURAL COMPONENTS

Base
  ▼ Base joint

Body
  ▼ Shoulder joint

Upper arm
  ▼ Elbow joint

Forearm
  ▼ Wrist joints

Hand
MiniMover-5

THE MOTORS

On the extension member there isn’t any motor

All six drive motors are mounted in the body

The six drive gears are mounted on the same shaft
A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements.

**ADVANTAGES**
- Low cost
- Ruggedness
- Simplicity in construction
- No maintenance
- The rotation angle of the motor is proportional to the input pulse

**DISADVANTAGES**
- Resonance effects
- Relatively long settling times
- Losses at speed are relatively high and can cause excessive heating
- Rough performance at low speed unless a microstep drive is used
Parallel Port

BASICS: INPUTS AND OUTPUTS

• 8 output pins accessed via the DATA Port
• 5 input pins (one inverted) accessed via the STATUS Port
• 4 output pins (three inverted) accessed via the CONTROL Port
• The remaining 8 pins are grounded

EVOLUTION

SPP (Standard Parallel Port)
EPP (Enhanced Parallel Port)
ECP (Extended Capabilities Port)
IEEE 1284
A circuit has to be as simple as possible because the more components you have, the easier it is for it not to work.

Before designing the whole circuit we started by controlling just one stepper motor.

SAA1027

L293D

SOLD OUT
The Circuit

COMPONENTS

• L293D: motor driver
• HEF4027B: dual JK flip-flop
• HEF4030B: quadruple XOR function
• HCF4050: non-inverting hex buffer
• HCF4049: inverting hex buffer
• Stepper Motor
  • 4 phase permanent magnet
  • 6 lead
  • 7.5 degrees per step
  • 48 steps per revolution
  • 0.33A per phase
  • Coil resistance 36 ohms per phase
The Board

THE SCHEMATIC I

parallel port

connection for the micro switch

header

logical devices

stepper motors
The Board

THE SCHEMATIC II

 buffers
 JK flip-flops
 XOR gates
 motor driver
 header

Manipulator Control Board
The Board

THE PCB

Bottom layer

Top layer

120 mm

135 mm
Conclusion

TECHNICAL CONCLUSION

PERSONAL CONCLUSION

Thumbs up