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Safety Report

Designing and Testing a Rotating Climbing Wall Motor Drive System

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19/8/2024

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Overview of Work to be Performed

This project involves the testing of an AC servo motor and driver for the use on a rotating climbing wall. The motor needs to be controlled through a simple speed control script that needs to be developed and tested using an Arduino and Le Potato microcomputer.

The work will be conducted in the Mechatronics lab, requiring the use of various tools and equipment for cutting, soldering, wiring, and assembling components.

Electrical components: Arduino UNO, Le Potato, Nema 23 Stepper motor and driver, MiGE 130ST-M10010 servomotor and driver, 42V power supply. Various wires, resistors and electrical components. Soldering iron and solder, heat shrink tubing.

Mechanical components: MiGE Motor Bracket, Electronics Cover

Tasks to be Completed

- **Build and Test Electronic Circuits**: Design, assemble, and verify the functionality of the circuits for motor speed control.
- **Programming and Integration**: Develop the software for speed control.

Required Tools and Equipment

- **Soldering Equipment**: Soldering iron, solder, and flux for assembling electronic circuits.
- **Wiring Tools**: Wire strippers, and connectors for electrical connections.
- **DC Power Supply**: 12V DC power supply to power electronics and circuits.
- **Testing Instruments**: Multimeter, and oscilloscope for verifying circuit functionality.
- **Programming Tools**: Computer with software development environment for coding and debugging the control system.

General Housekeeping

The following general housekeeping steps must be taken:

- Return any used tools to their slot in the toolshed
- Dispose of any post-work waste such as wire cut-offs
- Sweep the floor of the used workspace
- Log out of computers after use
- Ensure used workspace is clear and clean
- Ensure no personal belongings are left behind

Fire Safety

Due to the use of a soldering iron for wiring and a heating element as part of the heating sub-system, the following fire safety steps must be taken (The evacuation route if a fire occurs is shown at the end of the document):

Soldering Irons:

1. **Use a Soldering Iron Stand**: Always place the soldering iron in its stand when not in use to prevent accidental contact with flammable materials.
2. **Keep Workspace Clear**: Ensure the workspace is free of flammable materials like paper, plastic, and fabric. Keep only essential tools and components on the workbench.

3. **Inspect Equipment**: Regularly check the soldering iron for any damage to the cord or tip. Do not use the soldering iron if it is damaged.
4. **Personal Protective Equipment (PPE)**: Wear safety gloves to prevent burns. Use a heat-resistant mat to protect your work surface.
5. **Do Not Leave Unattended**: Never leave a hot soldering iron unattended. Always turn it off and unplug it when you leave your workstation, even for a short time.
6. **Proper Handling**: Handle the soldering iron by the insulated handle and be aware of the hot tip's location at all times to avoid burns.
7. **Cool Down Properly**: Allow the soldering iron to cool down completely on its stand before storing it away.

General Lab safety Instructions

- No testing outside regular hours, unless prior authorization is granted.
- All individuals must undergo a safety briefing before testing.
- Protective footwear is compulsory in the laboratory at all times.
- Wearing of loose or baggy clothing is not allowed.
- Maintaining a clean and orderly workspace is essential for safety and efficiency.
- The consumption of food and beverages is not permitted within the laboratory.
- Special care must be taken in the DIC laboratory due to the presence of delicate optical instruments which must not be subjected to impact, falls, or rough handling.
- A copy of the safety report should be displayed and easily accessible throughout the duration of testing.
- Personal protective equipment (PPE) such as lab coats, gloves, and safety goggles should be worn at all times.
- Electrical safety measures must be observed, including proper handling and storage of cables and devices to prevent tripping hazards and electrical accidents.

Activity-based Risk Assessment

Activity	Risk	Risk Type	Classification of Risk Severity	Mitigating Steps
Movement in the lab	Tripping over and/or knocking over equipment or materials	P, E	Acceptable risk	Keep workstation organised, be aware of surroundings
Turning on equipment	Electrical shock	P	Possible risk	Check over wiring to ensure connections are secure and insulated
Wiring circuits/component	Electrical shock, short	P, E	Possible risk	Double check connections, use insulated tools, ensure power is

s	circuits			off when wiring
Testing component functionality	Electrical shock	P	Possible risk	Ensure all connections are secure, and all wires are insulated
Calibration of sensors	Inaccurate measurements	E	Possible risk	Follow manufacturers guidelines and compare with results with accurate sensors
Soldering wires	Burning, inhalation of fumes	P	Possible risk	Use soldering iron with a stand and wear gloves, work in well-ventilated area
Programming sub-systems	Code with bugs leading to unexpected system behaviour	E	Possible risk	Debug code using the IDE debugger, test code systematically to ensure all sections of code behave as expected
Testing automated systems	Unexpected movements of actuators	P/E	Possible risk	Make sure hands are clear of moving parts, cover moving parts to prevent injury
Turning off equipment	Electrical shock	P	Possible risk	Make sure all equipment is powered down correctly
Tidying lab	Cuts from sharp edges, tripping	P	Possible risk	Be cautious of surroundings and sharp tools and components. Wear protective gloves
Personal valuables in the laboratory	Theft of valuables	P	Acceptable risk	Do not bring unnecessary, valuable items to laboratory sessions. Valuables that are brought to the laboratory should be placed in a safe and visual location

P - personal; E - equipment

Disciplinary Actions

Failure to comply with any of the aforementioned safety regulations or procedures will result in disciplinary action. Students will be issued an initial warning: after three warnings, the lab access is revoked for a month.