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| **School(s):** | | | Mechanical Engineering | | | | | | Group/PI: | L4 Humanoid Project/Chengxu Zhou |
| **Risk Assessment Title:** | | | Test of an Unitree A1 motor | | | | | | Assessment No: | RRLab-RA001 |
| **Location of Activity:** | | | Real Robotics lab | | | | | | Name of Assessor: | Michal Nowinski |
| **Details of Activity:** | | | An electric motor will be tested for its torque characteristic through the use of weight attached to a metal beam bolted to motor's rotor. In addition to the motor a battery will be used as a source of power for the motor as well as a computer to record the data. | | | | | | | |
| Other assessments or documents which might also be required, X if needed: | | | | | | | | | | |
| **Manual Handling** |  | **COSHH** | |  | **Noise** |  | **Other (please specify)** |  | | |

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| **Signature of Assessor** | |
| **Signature:** Michal Nowinski | **Date:** 05/12/2022 |
| **Signature of Manager(s)**  “The risks identified in this assessment are controlled so far as is reasonably practicable” | |
| **Signature:** Dr Chengxu Zhou | **Date:** 05/12/2022 |

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| **Date of Reassessment**  (Every two years minimum) | **Are There Any Changes To The Activity Since The Last Assessment?** | **Signature of Manager** |
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| **Name of Person Undertaking the Activity** | **School** | **Role** | **Signature** | **Date** |
| Michal Nowinski | Electronic and Electrical Engineering | MEng student | Michal Nowinski | 05/12/22 |
| Christopher Peers | Mechanical Engineering | Ph.D. student | Christopher Peers | 05/12/22 |
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| **LIKELIHOOD (L)** | |  | **SEVERITY (S)** | |
| **5** | Inevitable | **5** | Very High –Death or permanent disability |
| **4** | Highly Likely | **4** | High – Serious injury (hospital admission) |
| **3** | Possible | **3** | Moderate - RIDDOR over 7 days |
| **2** | Unlikely | **2** | Slight - First Aid treatment |
| **1** | Remote Possibility | **1** | Nil - Very Minor |

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| **RISK RATING** | **ACTION** |
| 1 – 4 | Broadly Acceptable - No action required |
| 5 – 9 | Moderate - Reduce risks if reasonably practicable |
| 10 – 15 | High Risk - Priority Action to be undertaken |
| 16 – 25 | **Unacceptable - Action must be taken IMMEDIATELY** |

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| **RISK RATING = LIKELIHOOD X SEVERITY** | | | | | | |
| **SEVERITY (S)** | **5** | 5 | 10 | 15 | 20 | 25 |
| **4** | 4 | 8 | 12 | 16 | 20 |
| **3** | 3 | 6 | 9 | 12 | 15 |
| **2** | 2 | 4 | 6 | 8 | 10 |
| **1** | 1 | 2 | 3 | 4 | 5 |
|  | | **1** | **2** | **3** | **4** | **5** |
| **LIKELIHOOD (L)** | | | | |

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| **PROCESS / ACTIVITY NO.** | **HAZARD**  e.g. Falling Objects, Fire, Explosion, Noise, Violence etc. | **PERSONS**  **AT RISK**  e.g. Employees, Contractors, Members of the public | **POSSIBLE OUTCOME** | **RISK**  **RATING**  **WITHOUT**  **CONTROLS**  **(LXS)** | **CONTROL MEASURES**  e.g. Guards, Safe Systems of Work, Training, Instruction, Authorised Users, Competent Persons, Personal Protective Equipment (PPE) | **RISK**  **RATING**  **WITH CONTROLS**  **(LXS)** | **FURTHER ACTION REQUIRED?**  Yes/No |
| 1 | Weights falling off of the test rig | Staff  Students | Personal Injury, property damage. | 12 (3x4) | Motor will be placed in a test cage. Personnel will remain outside of a marked area when motor is operating. Motor controls will be disarmed before personnel is allowed to enter the marked area. Motor will be run at low speeds. | 2 (2x1) | No |
| 2 | General Risks in Industrial Environments | Staff  Students | Personal injury, electrical safety | 9 (3x3) | Operation area and all nearby surroundings will be cleared of any machinery and/or hazardous loose equipment. | 3 (1x3) | No |
| 3 | Electricity | Staff  Students | Contact with exposed electronics may cause a  shock or fire. | 9 (3x3) | Batteries charged using proper equipment. Batteries stored and transported in dedicated boxes.  Electronics enclosed as much as possible in use, no exposed contacts. | 3 (1x3) | No |
| 4 | Slips, trips and falls | Staff  Students | Personal injury | 6 (3x2) | Any long cables are taped and marked clearly on the floor to minimise risk. | 2 (1x2) | No |
| 5 | Testing system losing balance and falling | Staff  Students | Personal injury, property damage. | 9 (3x3) | Motor's stand will be bolted to the floor. | 3 (1x3) | No |
| 6 | Cables getting entangled in rotating part of the test rig | Staff Students | Personal injury, property damage. | 9 (3x3) | All cables will be routed by motor's stand support beams to the ground and taped to it. | 3 (1x3) | No |
| 7 | Trapping fingers in moving part of the test system | Staff Student | Personal injury | 12 (3x4) | Motor's stand will be fixed to the floor. No one will be admitted to the test cage during motor's operation, a sign will be placed at the cage enttrance to inform about it. | 4 (1x4) | No |
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| **ACTION**  If further action has been identified above, describe what needs to be done, by whom with agreed timescales for completion | | | |
| **Description** | **Who** | **Target Date** | **Completed On** |
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| **COMMENTS AND INFORMATION**  Use this section to record any additional information, comments, dynamic risk assessment comments etc. | | | |
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**Process / Activity Log**

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| **PROCESS / ACTIVITY** | **PROTOCOL REF. NO.**  e.g. SOP, COSHH, OOH/LONE WORKING |
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