**LinuxCNC for Rose Engine**

**Task Automation**

**Project Design Document**

**Version 0.03**

**09 November 2023**

# Project Overview

This project is to develop a standardized approach for the use of LinuxCNC to automate repetitive tasks on a rose engine.

# Project Scope

## Items in Scope

1. This system is designed to allow for the automaton of tasks, especially those tasks which might be tedious.
2. This system is designed to facilitate simultaneous and smooth movement on all the designed axes.

## Items Out of Scope

1. This system is not designed to facilitate high-speed movement.
2. This system is not designed to allow the user to design a component off-line and have the system complete the design.

# Project Requirements

## General Requirements

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| --- | --- |
| **G001** | The system shall use as many off-the-shelf components as possible. |
| **G002** | The system shall be implementable by someone with a reasonable level of skills |
| **G003** | The system’s cost should be minimized. |

## Functional Requirements

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| --- | --- |
| **F001** | The system shall use text files with movements encoded using G-code to automate the tasks. |
| **F002** | The system shall drive movement on the rose engine using stepper motors. |
| **F003** | The system shall allow the rose engine user to disengage the stepper motor and freely move along (or rotate about) any given axis. |

## Movement Requirements

A diagram of a graph

Description automatically generated

The system shall have the ability to control movement along standard lathe axes as shown in the diagram to the right.

The nomenclature used in this document is meant to comply with the International Standards Organization’s ISO/R 841.

Figure - Lathe Axes

|  |  |
| --- | --- |
| **M001** | The system shall support control of movement across the bed of the lathe, perpendicular to the axis of the spindle’s rotation.  **Notes:**   1. This is denoted as the X axis. 2. Positive numbers are movement towards the operator (following the right-hand rule for lathes). 3. This axis of movement is foreseen as needed for  * Movement of the tool when held in a cross slide. * Movement of the tool when held in a linear slide (such as when cutting threads). * Movement of the tool when held in a curvilinear slide. |
| **M002** | The system shall support control of movement above the bed of the lathe, perpendicular to the axis of the spindle’s rotation.  **Notes:**   1. This is denoted as the Y axis. 2. Positive numbers are movement down, towards the lathe’s bed (following the right-hand rule for lathes). 3. This axis of movement is foreseen as needed for  * Movement of an object held in a dome chuck or a pencil chuck. |
| **M003** | The system shall support control of movement along the bed of the lathe.  **Notes:**   1. This is denoted as the Z axis. 2. Positive numbers are movement towards the lathe’s tailstock (following the right-hand rule for lathes). 3. This axis of movement is foreseen as needed for  * Movement of the tool when held in a cross slide. * Pumping of the item held at the end of the spindle is movement along the Z axis. |
| **M004** | The system shall support control of spindle rotation (i.e., rotation about a line which is parallel to the Z axis).  **Notes:**   1. This is denoted as the C axis. 2. Positive numbers are rotation following the right-hand rule (thumb pointed in the direction of +Z). For lathes, this is considered reverse rotation. |
| **M005** | The system shall support control of rotation about a line which is parallel to the spindle’s axis of rotation.  **Notes:**   1. This is denoted as the C1 axis. 2. Positive numbers are rotation following the right-hand rule (thumb pointed in the direction of +Z). For lathes, this is considered reverse rotation. 3. This axis of rotation is foreseen as needed for  * Rotation of a rosette at a different speed from the spindle * Use of a reciprocator, but not driving the motion using a linkage integrated with the spindle. * Use of an undulator, but not driving the motion using a linkage integrated with the spindle.  1. This axis of rotation is foreseen as also needed for  * Rotation of a rosette at a different location from the spindle (i.e., the rosette barrel is not on the spindle). This is how the Cler lathe’s rosettes are handled. |
| **M006** | Rotation about a line which is parallel to the Y axis.  **Notes:**   1. This is denoted as the B axis. 2. Positive numbers are rotation following the right-hand rule (thumb pointed in the direction of +Y). 3. This axis of rotation is foreseen as needed for  * Rotation of a spherical rest. * Rotation of an item held in a dome chuck or a pencil chuck. |

# Modification History

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| Version | Date | Comments |
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