Generic CAM - Users manual

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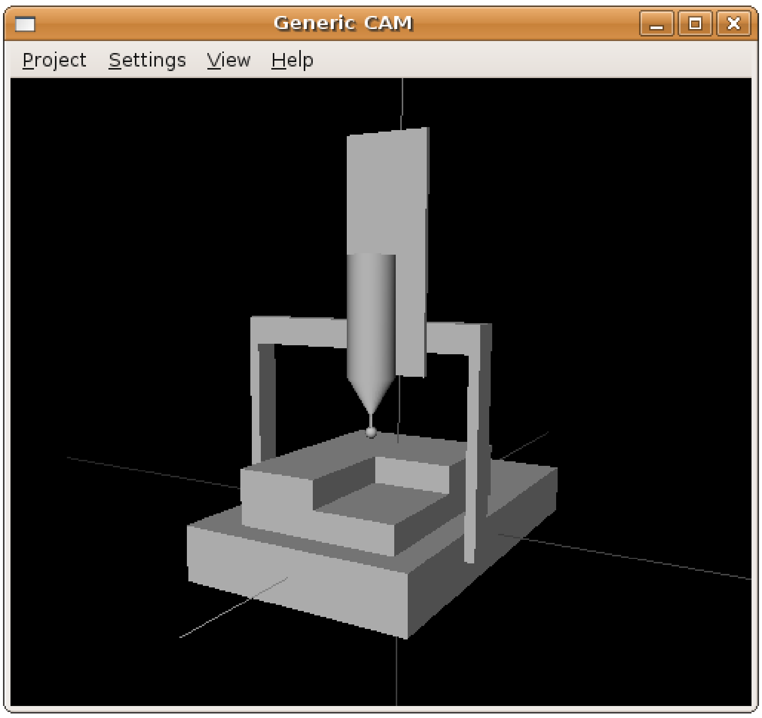

Contents

1 Introduction

Generic CAM is an open source tool path generator for CNC machines. The "Generic" in Generic CAM stands for being universal. i.e. every type of CNC machine can be targeted (Multi axis: X, Y, Z, A, B, C, U, V, W). Generic CAM starts from CAD data provided in STL or GTS file format. Based on the capabilities of the selected CNC-machine G-codes are generated.

2 Usage

2.1 Overview

To generate G-codes for a project You have to:

- Load geometry data.
- Load a machine description.
- Setup the raw material.
- Calculate tool-paths.
- Simulate the result.
- Export the G-codes.

2.2 Loading objects

2.2.1 Slicing objects

2.2.2 Mold form generation

[1]

2.3 Load a machine description

2.4 Definition of tools in toolbox

2.4.1 General parameters

Shaft diameter and shaft length describe the part of an tool that disappears inside the chuck.

Maximum speed is the max speed, the tool can handle before it suffers from a loss of structural integrity.

The feed coefficient f_z is the amount of material a tooth of the tool can eat away per revolution.

Material	f_z for a tool diameter of $d = 2 \ldots 4$ mm	$d = 5 \ldots 8$ mm	$d = 9 \ldots 12$ mm
Aluminum	0.04	0.05	0.10
Brass, copper, bronze	0.04	0.05	0.10
Steel	0.02	0.03	0.06
Thermoplastics	0.05	0.06	0.07

I have found no feed coefficient data for different types of wood.

[1] read: "How to make chocolate Easter bunnies."

2.4.2 Tool-shape

The shape of the tool is constructed from short segments. Each segment can either be a cutting or not. Possible shape elements are:

- Straight or bend line.
- Height change followed by a diameter change.
- Diameter change followed by a height change.
- Circle, the radius is orthogonal at the top of the segment.
- Circle, the radius is orthogonal at the bottom of the segment.

2.5 Define stock material

2.6 Toolpath

2.6.1 Generation

2.6.2 Settings

2.6.3 Simulation

3 Writing machine definitions

Machines for Generic CAM are defined as small LUA programs.

LUA[2] is a programming language developed by a team from the Pontifical Catholic University of Rio de Janeiro in Brazil.

The machine descriptions consist of two parts:

1. Description of the components of the machine.
2. The function **AssembleMachine()** with instructions to where all the parts belong.

To generate geometry the commands **box**, **cylinder**, **loadstl** and **loaddxf** are used.

The very first geometry generated belongs to the base of the machine. This geometry is fixed and does not move at all.

The next command is **addcomponent**. Geometry definitions following this command are added to the defined component. An abitrary number of components can be defined.

Special components are **tableorigin** and **toolholder** these commands have to be in the machine description exactly once. They describe where the stock material and the tool is placed. Table and tool may move freely. In a 5-axis CNC mill for example the table rotates around two axis and the tool moves in X, Y, and Z.

3.1 Commands

3.1.1 addcomponent

Starts a new component in the machine description.

3.1.2 identity

Usage: identity();

3.1.3 translate

Usage: translate(tx, ty, tz);

3.1.4 rotate

Usage: rotate(rx, ry, rz);

Usage: rotate(rx, ry, rz, ox, oy, oz);

[2] www.lua.org

3.1.5 box

Usage: box(h, w, d);

3.1.6 cylinder

Usage: cylinder(...);

3.1.7 loadstl

Usage: loadstl('filename');

3.1.8 loaddxf

Not yet implemented!
Usage: loaddxf("filename");

3.1.9 setstyle

Usage: setstyle(r, g, b);

3.1.10 toolholder

Usage: toolholder();

3.1.11 tableorigin

Usage: tableorigin();

3.1.12 placecomponent

Usage: placecomponent("componentname");

3.2 Modelling machines with Blender

The software blender is a free 3D modeller. It is available from www.blender.org.

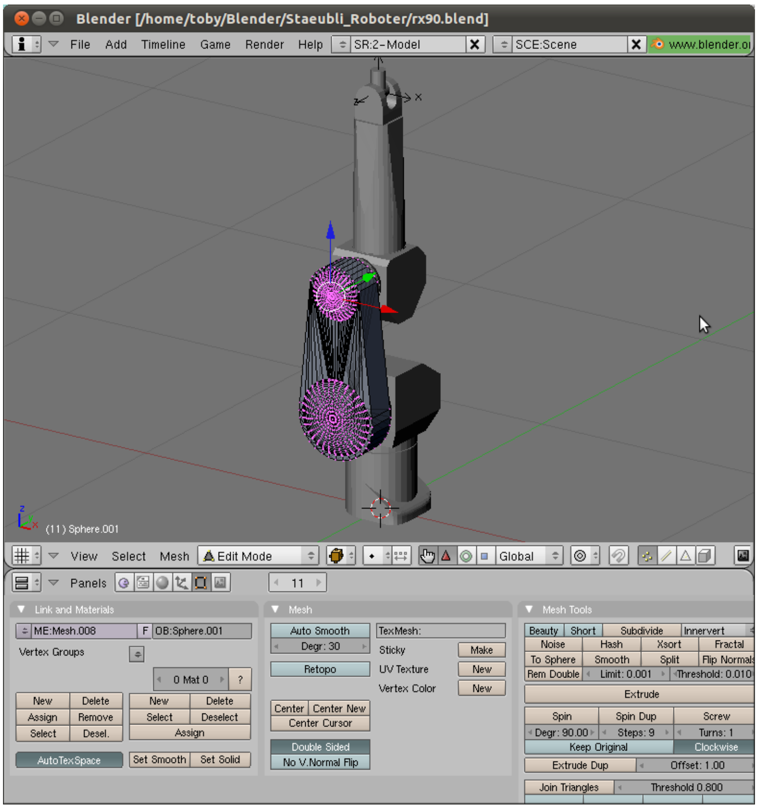

Figure 1: Modelling a Stäubli RX-90 robot with Blender