Faculty of Computers and Artificial Intelligence

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Introduction to Software Engineering

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Woodworking Design

Individual Task

Information on the program for the woodworking design system can be obtained from various sources including:

- The client or stakeholders
- Similar woodworking design systems and any available documentations that have already been released
- Domain experts which are in this case the users of the system: carpenters, cabinet makers and wood craftspeople
- By searching and understanding the process of designing woodworks, and how this system is supposed to help wood craftspeople in their designing process. (This can be done through online or offline resources)

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WOODWORKING DOMAIN ANALYSIS

This domain analysis is made in order to help successfully create a woodworking design system. The subject to understand here is the stages of creation of woodworks and how this software will help woodworks craftspeople in that process.

The following are few terminologies understood by all woodworks craftspeople:

- Cut List: This is a list which includes the exact measurements of all the wooden supplies needed by the craftsperson in order to build what he/she wishes to do so. It also includes the quantity required of each of these items and may often include the type of wood to be used.
- Sequence of Cuts: This is the steps needed in order to reach the final desired dimensions of wood from a normal piece of wood.
- Wood Grain: The pattern visible on wood as a result from wood fibres.
- Rip Cut: Cutting wood parallel to wood grain.
- Cross Cut: Cutting wood in a way perpendicular to wood grain.
- Lumber: Wood that has been cut into regular sizes.
- Mill: A machine that cuts wood.
- Joints: The is a term that refers to the junction joining two or more pieces of wood
- Joinery: This is a term concerned with the process of joining two or more pieces of wood together.
- Dry fit: Ensuring that wood components fit together perfectly before adding glue or any other materials to permanently fix them in place.

In the absence of computer aided design (CAD), craftsperson usually creates a piece of woodwork or furniture in the following way. First, before buying any wood, the craftsperson plans with the aid of a pencil and paper how the final product should look like. After that, the craftsperson plans on what dimensions of wood components is needed to be able to reach the final product. After that the craftsperson will be able to successfully create a cut list, which specifies the exact dimensions of the wooden components to be used.

After the planning and designing process is over. Now is the time for implementing these plans. The craftsperson starts by first buying wood that best suits his/her previous plan. After that, a mill is used to cut the wood into the exact dimension of the desired component as previously planned. Now is the time for joints. Joints has to be cut as well in order to be able to join pieces of wood together. After that, the craftsperson should dry fit all the wooden component to make sure that they fit perfectly.

Afterwards, glue or other adhesive material is added in the joints and a clamp is used to put pressure on the joint to ensure they are indeed permanently fixed. Now the wooden structure is ready to be processed into the final product.

Users of this software would be carpenters, wood craftspeople and cabinet makers. These users would be the main actors of this system. Alternatively in large wood companies, a middle-man experienced in transforming paper drawn designs into 3D models might be instead the user of this system.

It must be noted that currently similar software products exist in the market. These includes namely, 'sketchlist' and 'sketchup'.

Requirements

Functional Requirements:

Requirement ID	Requirement Description
FR01	Upon opening the system, there will be a sign-in page that asks the user for his/her username and password (given to each user by the organisation/administrator. This is done for security purposes so that users do not do tasks outside their authorised area of expertise. Upon successful sign in, the user will be granted access to the system
FR02	In the top right corner of the home screen, there is a profile picture of the user, upon clicking on this profile picture the user shall see be redirected to his profile which has all his/her details.
FR03	On the left side of the home screen, there shall be a toolbar which includes all types and shapes of wood that the user shall require to create his 3D model. Furthermore, upon choosing a particular type and shape of wood, the user has two options: - Enter numerically the desired dimensions of the wood block - Manually changing the dimensions of the wood using the cursor. This enables the user to visualise and accordingly change the dimensions of the wood block on the screen as much as he desires.
FR04	The colour of the wood block inserted into the whiteboard can be chosen by right-clicking on the wood block and choosing the change colour option. The user will have two options: - Enter the hexadecimal code of the desired colour - Chose a colour from the colour palette displayed on the screen
FR05	To the left of the profile photo of the user, there will be a button called history which enables the user to view all previous complete and incomplete models that the user created or modified.
FR06	With the help of keyboard button or the mouse, the user will be able to freely rotate the 3D model displayed on the screen. Furthermore, the user will be able to zoom in and out of this 3D model to examine all the details of that 3D model.
FR07	There will be a drop-down menu in the top right corner of the screen. This drop-down menu will have the following buttons: - Print cut list - Print 3D model - Print 2D projections - Print instructions
FR08	'Print cut list' button will print all the exact measurements that has been used in creating the 3D model along with the type of wood used.

FR09	'Print 3D model' button will print the 3D models from various angles such that any person will be able to visualise this printed 3D model
FR10	'Print 2D projections' button will print orthographic projection of the 3D model.
FR11	'Print instructions' button will be print the steps required to actually build the wooden structure illustrated by the 3D models. These steps will be in writing along with 2D illustrations.

Non-Functional Requirements:

Requirement ID	Requirement Description
NFR01	This system should work on Windows 7 or later, or alternatively on macOS 10.12 or later
NFR02	This system shall store the 3D models on a secure third-party cloud such that these drawings can be accessible to the users on all devices.
NFR03	The system is to perform 95% of the time with no errors or faults.
NFR04	If an error occurs and the system fails for whatever reason, the mean time to restore the system (MTTRS) should be at maximum 8 minutes.
NFR05	The system of measurement followed by the system is the metric system.
NFR06	The date format followed by the system is dd/mm/yyyy