Woodworking design system

1. **List of possible methods, resources and people:**

    a. **Methods**
        i. Taking with domain experts
        ii. Gathering the information by stakeholders
        iii. Gathering the information by any resources
            1. Websites
            2. Other software (but same domain)
            3. Books

    b. **Domain expert**
        i. Carpenters
        ii. Wood craftspeople
        iii. Stakeholders

    c. **Resources**
        i. 3D design resources
        ii. Mathematician
        iii. Books about 3D design
        iv. GeoGebra website

Domain Analysis

1. Introduction

This document describes information which is gathered about woodworking and designs. This information is to be used to guide the development of software. The domain is 'Woodworking design' The system should help the carpenters, cabinet makers and other woodcrafts people to make designs easily.

2. Glossary

a. **Carpenters:** skilled people who can make or fix something with wood and tools like furniture.
b. **Cabinet makers:** skilled carpenters who specialize in the construction of cabinets, which are boxes with shelves, drawers and doors used for storage and organization.
c. **Wood crafts people:** skilled individuals who work with wood to create various objects or structures such as furniture, sculptures, sculptures or buildings.
d. **Design variants:** different versions of the design share many characteristics but have slight differences in some parts.
e. **Atomic components:** the basic building blocks that make up the design. In this context, it refers to individual pieces of wood, metal appliances and other materials used in carpentry.
f. **Assembly Hierarchy:** a structure that organizes different levels of components or assemblies in a design. Each level represents a different level of complexity, with higher levels consisting of lower-level assemblies and components.
g. **Assemblies:** a set of components that work together to form a larger part of the design.
h. **Reused**: the practice of using a component or assembly in multiple designs.
i. **3-D geometry:** representation of the design in three-dimensional space using mathematical models such as points, lines and curves.
j. **The sequence of cuts and other operations:** the order in which various steps are performed in order to create a component or assembly. This includes cutting, drilling, sanding and other operations that are necessary for the formation and finishing of the component.
k. **Arcs and line-segments:** basic geometric shapes used to represent the curves and straight lines that make up a design.
l. **Vertices:** the points where two or more lines or curves intersect in the design.
m. **Face:** a flat surface on a component or group that has a specific shape and direction.
n. **Junctions:** the points where two or more pieces of wood come together.
o. **Two-dimensional projections**: representations of a design in two dimensions, such as a drawing or a diagram.
p. **Three dimensions projections:** representations of the design in three dimensions, allowing the user to view and interact with the design from different angles and points of view.

3. General knowledge about the domain

- The system designs or helps the users to design. It provides many things like 2-D and 3-D presentations. It should organize the different components of the design as assembly hierarchy. The system should store a lot of designs and show them to users.
- The system should show to the use the components of any design in as list and the substitutions of each part or component. It should display to users the component which can reusable and can't.
- Each piece of wood is described in terms of its 3-D geometry, the recommended type of wood, and the sequence of cuts and other operations required in order to make it. 3-D geometry should describe wood and its faces and vertices and how the wood connects (Junctions).
- The system allows its users to do a wide variety of operations to create and edit designs. Also, the system can visually display a design (or assembly, or component) in three dimensions (allowing the user to rotate it in space), and two-dimensional projections.

4. Customers and users

a. Potential customers

- The people who are interested in building their own furniture or home improvement projects, such as cabinets, shelves, and other wooden fixtures.

b. Potential Users

- The carpenters or the woodworkers that who design and make things and woodworking instructors or students.

5. The environment of the software

a. The environment of this software is focused on woodworking and the design and creation of wooden objects, with a specific emphasis on the use of computer-aided design to facilitate the process.

b. The software is a computer-aided design program designed for carpenters, cabinet makers, and other wood crafts people. It allows users to create and store any number of designs with design variants, which consist of atomic components such as pieces of wood and metal hardware attached to the wood.

c. The designs are broken down into a hierarchy of assemblies and components, which can be reused in different assemblies. Each piece of wood is described in terms of its 3-D geometry, recommended type of wood, and sequence of cuts and other operations required to make it. The 3-D geometry is described using arcs, line segments, and vertices.

d. The system provides a wide variety of operations to create and edit designs, and can visually display designs, assemblies, and components in three dimensions, allowing the user to rotate them in space, as well as in various two-dimensional projections.

6. **Tasks and procedures currently performed.**

   a. **Create new Accounts:** The system should save the accounts of each user.
   b. **Create new designs:** Users can create new designs by selecting and arranging the atomic components and assemblies within the system.
   c. **Store designs:** The software allows users to store any number of designs that they create.
   d. **Create design variants:** Users can create design variants by making substitutions to parts of the design while keeping most of the design the same.
   e. **Reuse components and assemblies:** Assemblies and components can be reused in different designs or assemblies.
   f. **Describe wood pieces:** Each piece of wood is described in terms of its 3-D geometry, the recommended type of wood, and the sequence of cuts and other operations required to make it.
   g. **Edit designs:** The software allows users to make changes to existing designs, such as adding or removing components, changing dimensions, or substituting materials.
   h. The system should show to users the order of operations for the installation and arrangement of the design.
   i. **Display designs in 2-D projections:** The software can display designs in various two-dimensional projections, allowing users to view them from different perspectives.
   j. The system should display the designs in three dimensions so that the user can rotate them in space.

Requirements

1. Functional Requirements:

a. The system should save the accounts of each user.
b. Ability to create and store designs: The software should allow carpenters, cabinet makers, and wood craftspeople to create and save any number of designs.
c. The system should save the designs of each user.
d. The system should show the designs as assembly hierarchy from easy to difficult.
e. The system should show the components of each design.
f. Reuse of assemblies and components: The software should allow users to reuse assemblies and components in different designs.
g. The system should show the reusable components.
h. 3-D geometry: The software should allow users to describe each piece of wood in terms of its 3-D geometry, including arcs and line-segments that connect at vertices.
i. Recommended wood types: The software should recommend different types of wood for each piece of the design.
j. Sequence of cuts and operations: The software should describe the sequence of cuts and operations required to create each piece of the design.
k. Junctions and faces: The software should describe the junctions between pieces of wood in terms of the faces that touch each other.
l. Editing and modification: The software should allow users to edit and modify designs, assemblies, and components.
m. The system should display the designs in three dimensions so that the user can rotate them in space.

2. Nonfunctional Requirements:

a. Software Quality requirements

i. Performance: The software should be able to handle large and complex designs without significant delays or crashes.
ii. Usability: The software should be user-friendly and easy to learn, even for those without extensive computer experience.
iii. Reliability: The software should be stable and consistent, with minimal errors or glitches.
iv. Accessibility: The software should be accessible to users with disabilities, such as those who are visually impaired or have limited mobility.

b. Platform requirements

i. The software should run at minimum (Android, windows) it also can run at (Linux, IOS).

c. **Process requirements**

i. **Design process:** The software should provide a user-friendly interface that allows users to create and modify designs easily. The design process should be intuitive and should support the creation of both simple and complex designs.

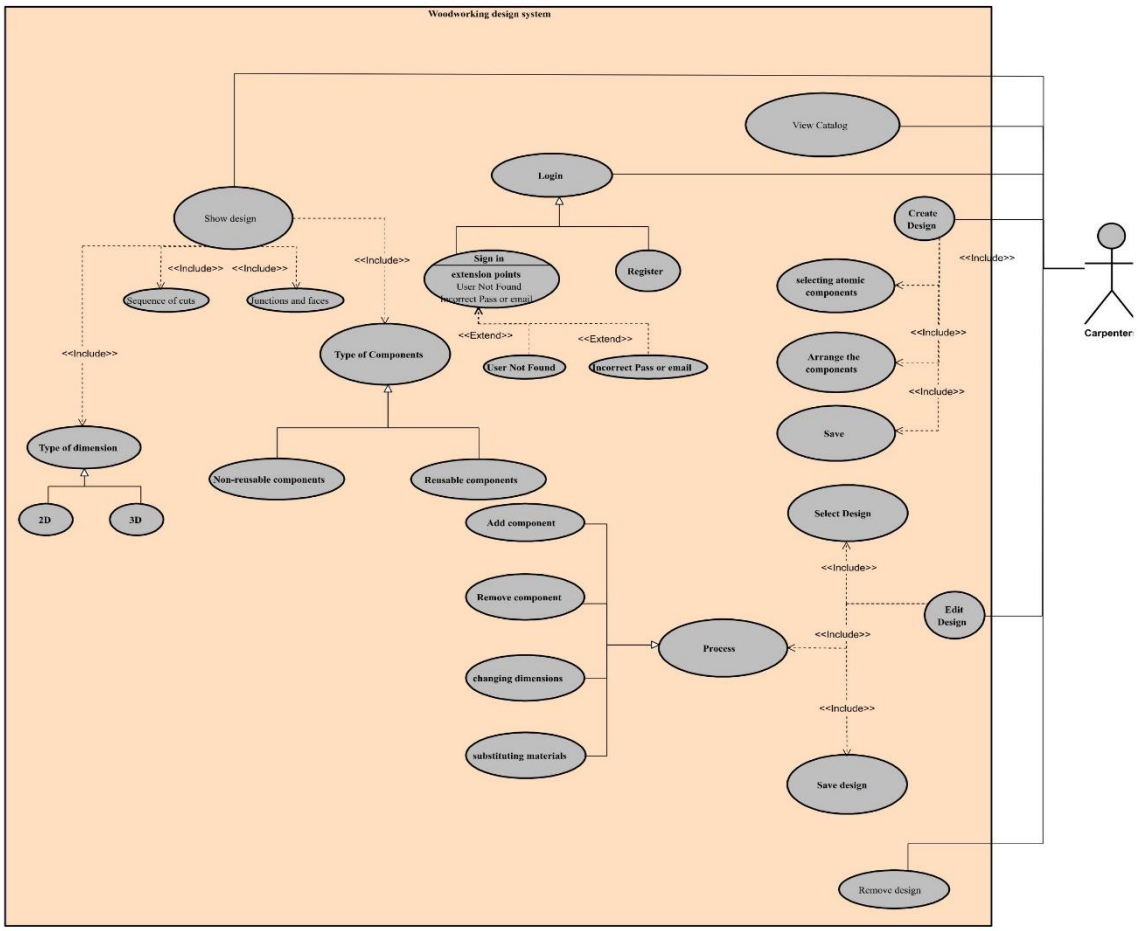
ii. **Quality control process:** The software should include a quality control process that ensures the accuracy and consistency of the designs. This may include automated checks for common errors or inconsistencies.

iii. **Security process:** The software should include robust security measures to protect the designs and data from unauthorized access or modification.

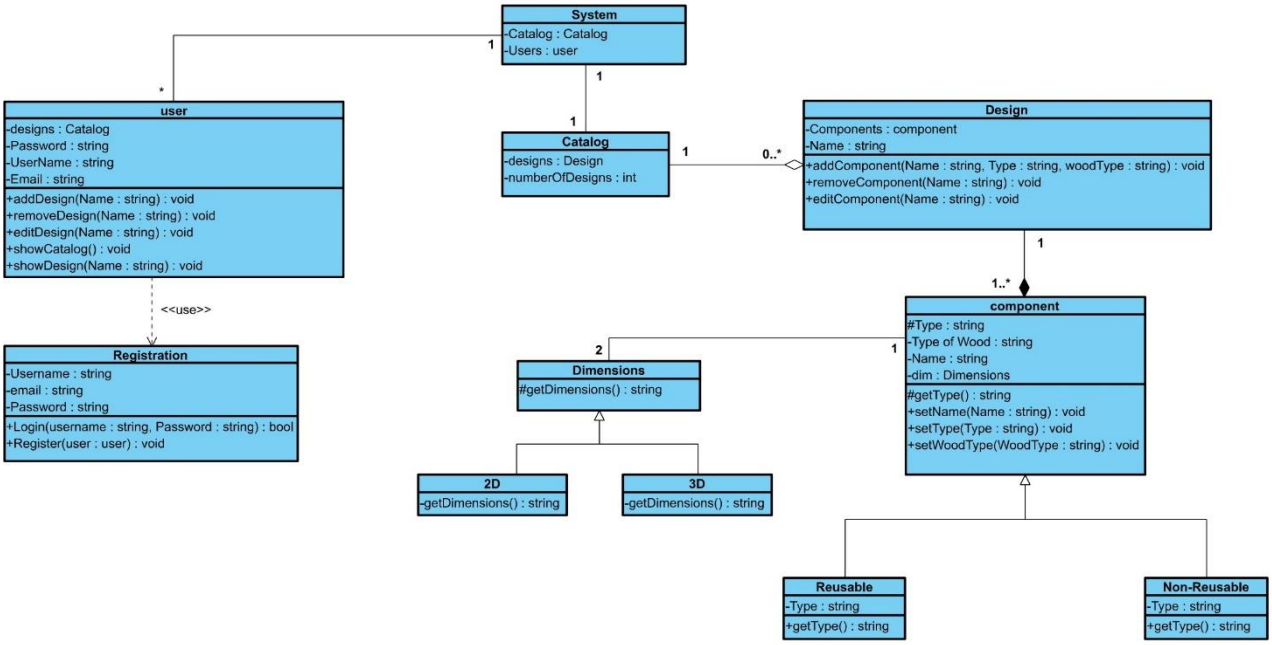
iv. **Testing process:** The software should undergo thorough testing to ensure that it meets the functional and non-functional requirements and is free from errors and bugs.

v. **Maintenance process:** The software should have a maintenance process in place to ensure that it remains up-to-date and is able to adapt to changing user needs and technological advancements. This may include regular updates and bug fixes, as well as ongoing support and documentation.

Use Cases



Class Diagram



List of all the Tools

To design class diagram and use cases.

1. **Visual paradigm**
2. **ArgoUML**
3. **LucidChart**