The Doors

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Abstract

This document outlines the final design of the jig, as well as the subsystems. The designs of each individual team member are also included, along with descriptions of the subsystems for each. There are three subsystems for the jig: the attachment, measurement, and adjustment system, explained below. After analyzing each of the individual designs, a final design was decided upon that will best suit the client's needs. The purpose of this document is to create a design that best satisfies the design criteria outlined in deliverable C.

Contents

Sub- Systems

Attachment System

The attachment sub-system is how the jig will attach itself to the door while in use. This sub-system will be designed in a way that will not damage the door but will hold the jig tightly in place to ensure precise holes are made and the jig is stable throughout the process. It is required that the attachment method is quick and user friendly.

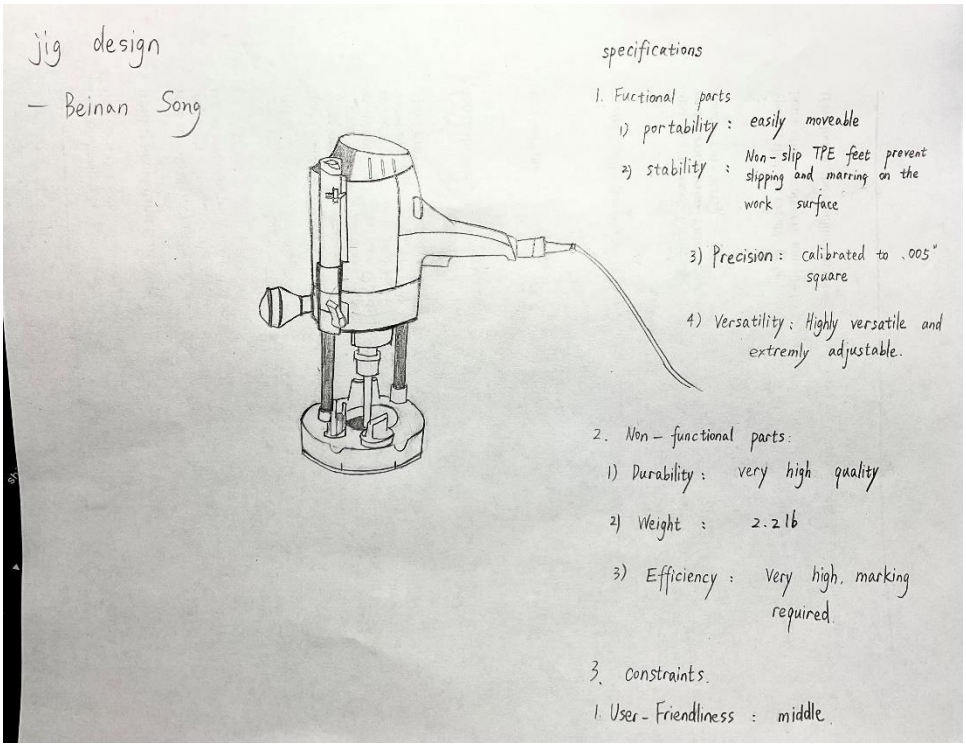
Measurement System

The measurement sub-system describes how the jig will guide the drill to make the holes and threads. It will be designed in a way that will provide consistent, properly placed holes for the corresponding hinge to be attached with. It is required that this system is designed in a way that will not over complicate the process and will improve efficiency. This system will also have to be adjustable to accommodate for the different sized hinges.

Adjustment System

The adjustment sub-system describes how the jig will adjust or change for the different hinges used when the doors are being manufactured. It will be designed in a way that will not jeopardize the integrity of the measurement sub-system and will also be efficient and user friendly. It is required that the system accommodates for both 5x5 butt hinges and 5x4 ½ butt hinges with varying backsets.

Groups Design’s



Beinan’s design

Three sub system descriptions

1. Attachment system

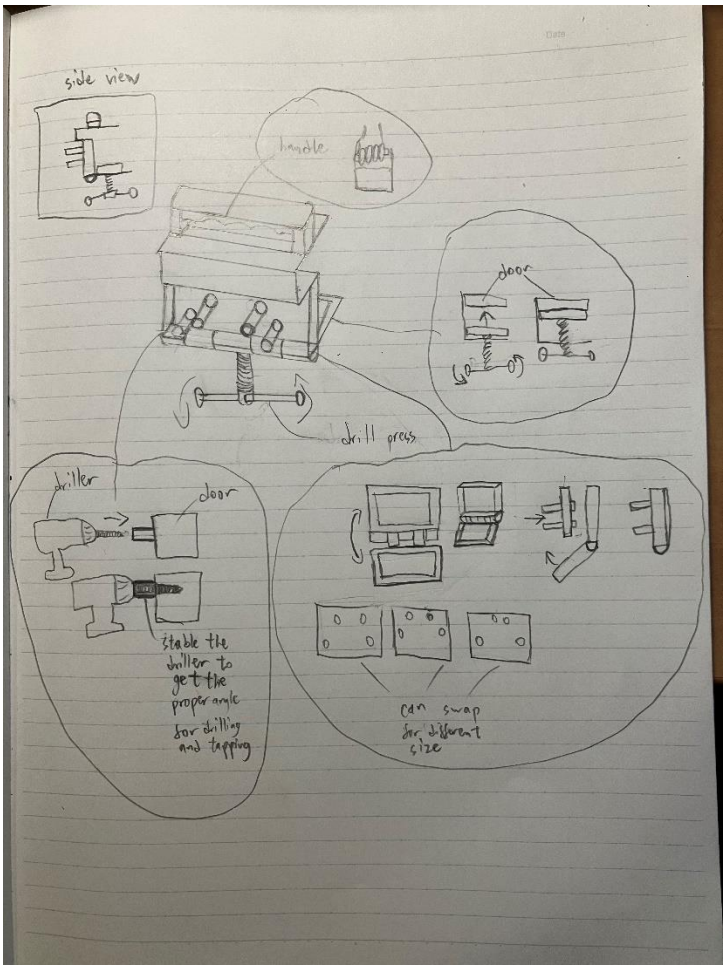
The jig has stable equipment that secures the drill in place and positions it accurately for drilling. This equipment ensures stability throughout the drilling process.

2. Measurement system

The jig incorporates calibrated marks to assist users in positioning the drill, ensuring consistent and accurate hole depth and placement.

3. Adjustment system

The jig features adjustable settings, including movable clamps, which can be modified to accommodate the required hinges and doors.



Quintin's design

Attachment system

A drill press is used to hold the jig in place, so that the worker doesn't need to hold the jig while drilling. As it is adjustable, it can be used for different size doors.

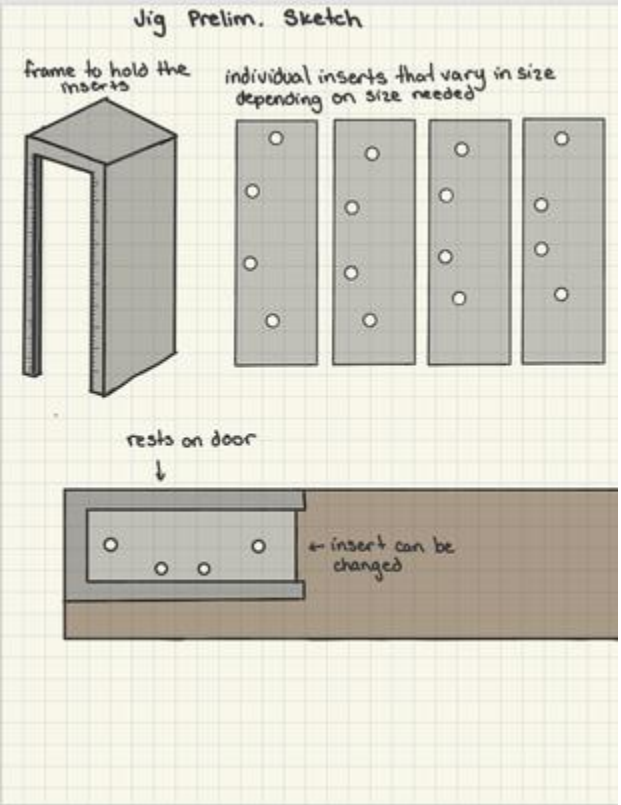
Measurement system

There is a metal piece with the correct placement of the holes for the hinge, and on the holes there are tubes. The holes will guide to the right place to drill, and the tube on the hole will stable the driller on the proper angle for drilling and tapping

Adjustment system

The jig will be adjusted by changing the metal piece with holes on it. There will be different plate with different set of holes to change with.

Emily's Design



Measurement System

The measurement sub-system for this design lies in the insertable pieces that vary in size depending on the size needed. Each insert will be incredibly precise in ensuring that the length, width, and backset requirements are met so that the guiding holes for the drill are at the proper location, eliminating the need for measuring. The user may simply insert the drill into the guide hole and drill to the desired depth.

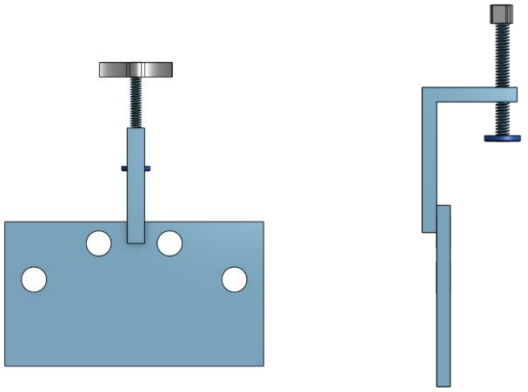
Attachment System

The attachment system simply involves laying the jig onto the door, wherever the user would like the guiding holes to be placed. The mechanism allowing the jig to properly stay is simply a matter of physics, so the user won't have to worry about the jig falling or damaging the door.

Adjustment System

The adjustment system for the jig is entirely in the insertable pieces as well. Each piece will be measured based on the size of hinge that the user will be drilling the holes for, so all they need to do is insert the corresponding piece into the frame, place it on the door, and drill the holes. The pieces can be inserted or changed in a matter of seconds, allowing for maximum efficiency.

Dennis's Design



Attachment System

The attachment system for this design will use friction as well as a clamping system to stay secure during manufacturing. The clamping system is a metal bolt with a foot made of a soft material that will screw down and apply pressure to the top of the door. This system will accommodate for any backset the client uses and will ensure minimal time is needed to install or remove the jig. There will be two versions of this jig, one with a front plate that is 5" x 5" and another that is 5" x 4 ½ ", each will slot into their respective routed out slots on the door and will not allow any horizontal movement.

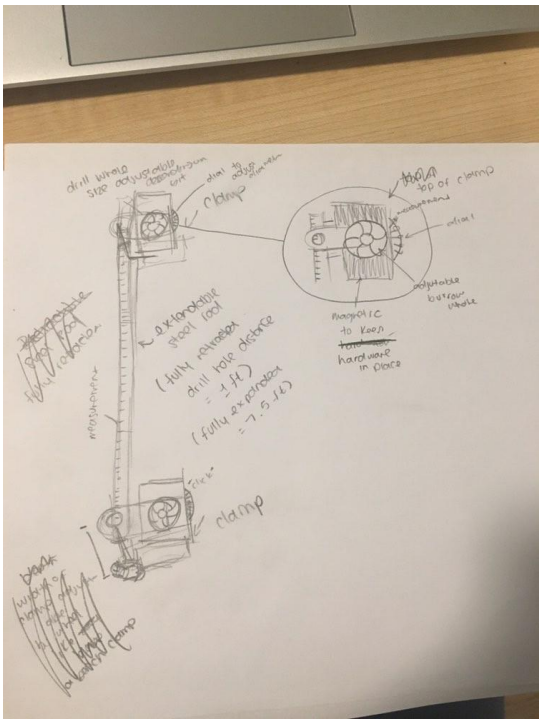
Measurement system

The measurement system for this design will utilize precisely placed holes in the front plate that are the size of the drill and tapping bit. These holes will remove the need for marking. They will also provide the experienced worker a guide to keep the drill straight. This will make the process as simple as placing the bit into the hole and pressing the trigger.

Adjustment system

The adjustment system for this jig will accommodate for all different measurements the clients need. The attachment system provides the adjustment for the backset as all the worker will need to do in order to adjust is tighten the bolt accordingly. The main draw back for this design is the method used for adjusting to the different hinge sizes. As previously mentioned, to accommodate there will be two versions of the jig which is not ideal. However, at any given time only one size of jig will be needed and I believe this sacrifice in adjustment is justified through the simplicity it allows. This simplicity creates a greater possibility that this jig is something the worker is going to want to use.

Danielle's Design



Measurement:

- measurement tick 0 starts in line with the centre of the drill hole.
- each segment of the telescopic rod has a starting tick of 1, extending all the way up to 4 segments of 24'' (2ft) = 96'' (8ft) at full extension.
- because the top piece of the clamp is magnetic around the drill hole, most hinges will be held in place where desired on both ends of the system.

Attachment:

- this system uses an adapted Bench Wood Working Clamp that allows the system to be used on any width of door
- again, with the magnetic underside of the clamp the hinge will be able to be lined at each hole (any distance apart)

Adjustment:

- With telescopic rod being used as the measurement system that distance between the clamps can be increased and decreased withing the parameters the system allows

the magnetic component of the top piece allows for the desired hinge to be moved or the rod to be retracted without interrupting the other system components on each clamp:

- with adjustable burrow hole built into the top piece of the clamp, any drill bit up to 1.5 inches in diameter can be used
- the magnetic component of the top piece allows for the desired hinge to be moved or the rod to be retracted without interrupting the other system components

Sub-System Evaluation

Rating system: Weight given is on scale from 1 to 5, 5 being high and 1 being low. Each specification for the individual products will also be evaluated from 1/worse to 2/better to 3/good on how well they satisfy the specification, red being worse, yellow being better and green being good. The weight will be multiplied by the secondary evaluations to calculate the totals.

Table 1- Measurement Sub-system

System / Criteria	Importance	Drill Holes	Telescopic Rod	Markings
Speed	5	Very fast	Manual adjustment required	Very fast
Adjustability	5	None	very	Some
Accuracy	5	Very	User dependant	User dependant
Ease of use	3	very	User dependant	Some training required
Total		44	41	38

Table 2- Attachment Sub-system

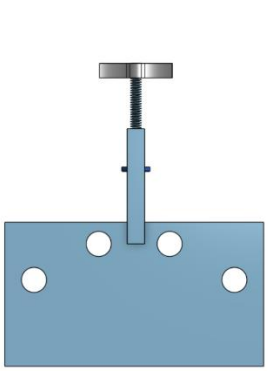
System / Criteria	Importance	Clamp	Drill press	Lying the jig onto the door
Easy to use	3	yes	yes	yes
Fast	3	yes	yes	yes
Attach on its own	5	yes	yes	yes
Does not damage the door	3	yes	yes	yes
stability	5	high	high	low
Total		57	57	47

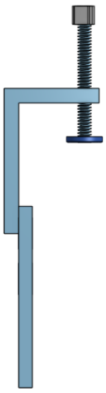
Table 3- Adjustment Sub-system

system / Criteria	Importance	Multiple versions	Swappable plates	Telescopic Rod	Jig adjustment
Speed	5	Very fast	Fast	Slow	Slow
Ease of use	4	Some	Some	Not very	Not very
Efficiency	5	Very	some	Not very	Not very
precision	5	very	very	Extremely	very

total		53	46	38	38

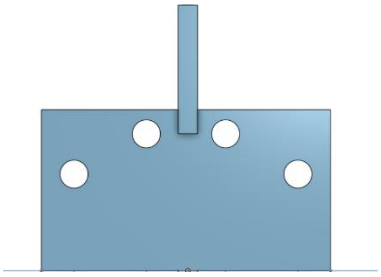
Proposed Design



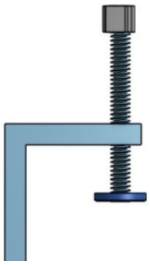


Based on the sub-system system evaluation, of the 5 current design ideas our group has selected this design to be the current design proposal. There are still adjustments to be made through prototyping and testing but this design current best fits the clients needs.

Measurement Sub system



Adjustment/attachment Sub system



Conclusion

After each designing a functional design, each with effective attachment, measurement and adjustment sub systems; we were able to an evaluation table to compare the pros and cons of each concept. Based on this evaluation we have decided at this time to go with Dennis' Design. This design combines simplicity with accuracy and effectiveness which is the best recipe for success for our task.