REPLICATION OF KEY USING 3D PRINTING

Using 3D printing to bypass physical security

This document aims to show how a 3D printer can be used to replicate a key and be used in pentesting context. The test has been made on Lockpicking training lock.

Made by Blandine LEMAIRE

Replication of key using 3D printer

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Disclaimer

- THIS DOCUMENT IS ONLY MADE ON A RESEEARCH PROOF FILE AND DOESN'T TEND TO BE USED AS A TUTORIAL.
- THIS PROJECT HAS BEEN MADE ON LOCKPICKING TRAINING LOCK; THE MODEL MADE HAVE BEEN EDITED SEVERAL TIMES TO ACHIEVE A PROPER MODEL OF KEY THAT WORK ON THE FIRST TRY.
- ON THE FIELD IT IS RECOMMANDED TO HAVE A FILE TO ADJUST THE TEETH OF THE KEY OR OTHER PART THAT MAY BE ON A WRONG SCALE.
- ALSO NOTE THAT THE PROJECT HAS BEEN TRIED ONLY ONCE, WITH A SPECIFIC LOCK AND NO PREVIOUS KNOWLEDGES IN 3D MODELING, PRACTICING THE TOPIC AND HAVING KNOWLEDGES ON 3D MODELING MAY HELP TO ACHIEVE A KEY THAT COULD WORK BETTER.

1 | Getting access to the key

To get this done we need two photos, one from the key and one from the lock.
Let's start with the lock because it's easier. it's easy to take a photo of a lock and not that suspicious.
For the photo of the key, it may be a bit trickier...
Let's assume that we can see and have a short period of time where we can photography the target key, at a party, on a table, or hanging from the pocket of a jacket on a chair for example
We need to get a photo of the key with at least one element that could help us to know the size of the key (a coin, a pencil cap, anything which can be find easily to have a size comparison).

Picture of the key next to a 5 ¥ coin

Picture of the lock next to a 5 ¥ coin

On my try, I've been using a key that was on the table and a 5 ¥ coin (optimal conditions of lighting and a good camera) A coin is a great way to know the size, just have to google it to know it's size.

Japanese 5-yen coin:

- : useful information

- Center hole diameter: 5 mm

Catalog number: KM 72, 72a, 96.1 and 96.2
Composition: c. 65% Cu; c. 35% Zn

- Diameter: 22 mm

After 10 second on google we now know that the coin used it 22mm of diameter.

2 | 3D modeling of the key

Let's open the photo of the key on a 3D modeling software (Here Fusion360 is used)

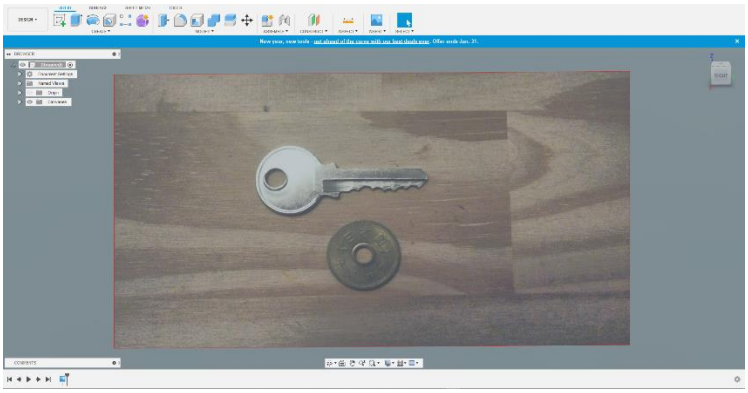
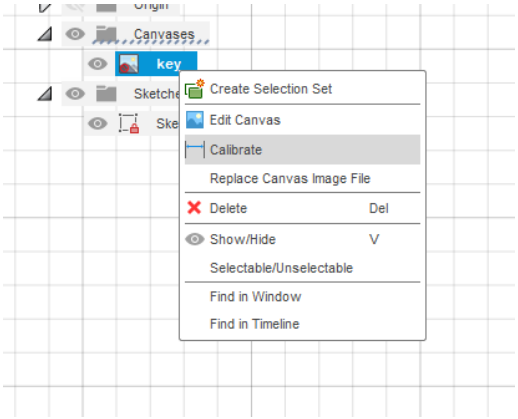
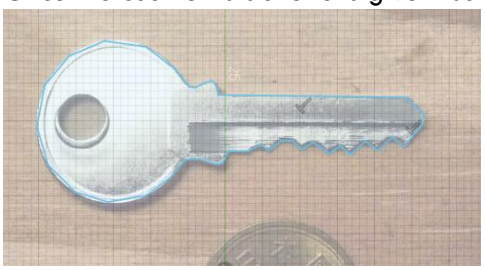


Photo of the key imported in Fusion360

To make the image being on the correct size on Fusion360, use the 'calibrate' option into canvas.



Then let's trace the key with the 'line' tool in the sketch tab.
Once the counter is done let's give it some volume by using the 'extrude' tool from solid tab.



Key counter done

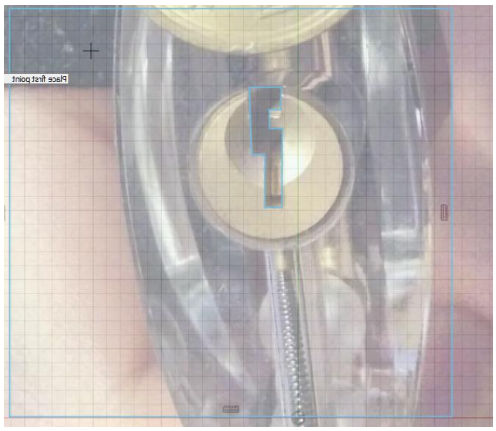
Volume given to the model

Now let's shape the lock in the key volume:

First place and set the canvas as a correct size as done with the key using the 'calibrate' option.

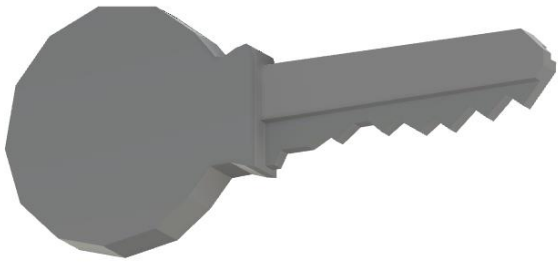
Make sure to place the canvas in the correct way on the key to avoid shaping the key on a mirror way

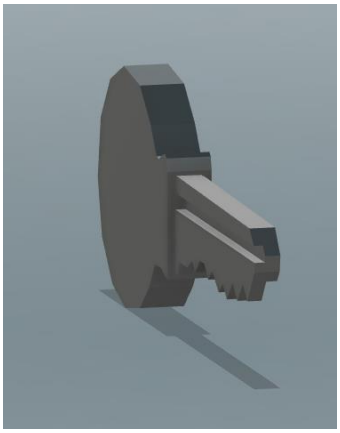
Then trace the pattern on the sketch.



Lock shaped

Once done extrude this sketch from the front of the key to give it this volume.
It should end up like this:





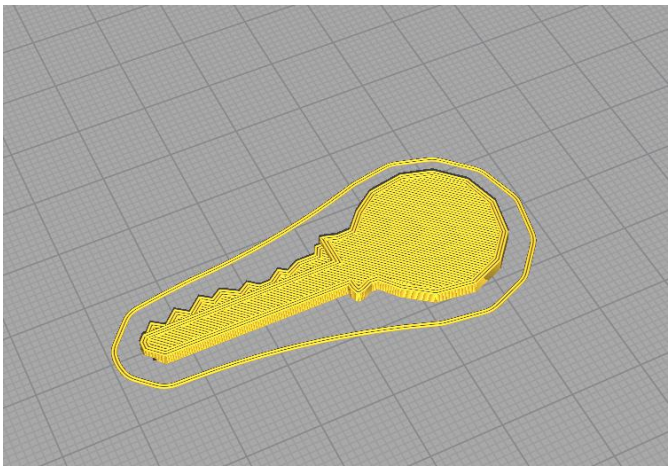
Key once finished

3 | Printing the key

Save your file and open it in a Slicer for 3d printer. (Here Cura is used)
Here is the parameters used for the print on an Anet A8 printer:

Layer height : 0.1mm
Infill density : 100 %
Printing temperature : 215 °C
Bed temperature : 60 °c
Printing speed : 60 mm/s
Infill speed : 40 mm/s
Support speed : 60 mm/s

Please note that depending on the printer precision, the material used (PLA or ABS) the parameters above may change.



View of the key once sliced in Cura