UNIVERSITÀ DEGLI STUDI DELL'AQUILA

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3D virtual guide for a handcrafted leather wallet

Group C

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Introduction

Background

- **<u>Handcrafted Italian leather products</u>** represent worldwide excellence.

This activity is **not digitized** and is **difficult to pass on.**
It is usually passed from father to son.

Purposes

- **To transfer a manual skills** from an experienced craftsman to a young trainee
- **To make this learning process more accessible and easier**
- To recreate old passions in young people

➢ **Italian Leather Wallet**

- Easy process compared to other leather products
- Same as Japanese leather product

System for passing on the skills of making Italian leather wallets

Motivations and benefits

By using the system we propose,

young workers can learn the skills on their own.

×technical schools or pupils of skilled craftsmen

×much time to pass on the skills to young worker

➢ **The craftsmen can enjoy a higher work flexibility.**

Needed elements

Leather pieces

- 2 rectangles
- 2 smaller rectangles
- 3 card pockets
- A pocket cover
- A coin pocket
- A stripe

Machines and tools

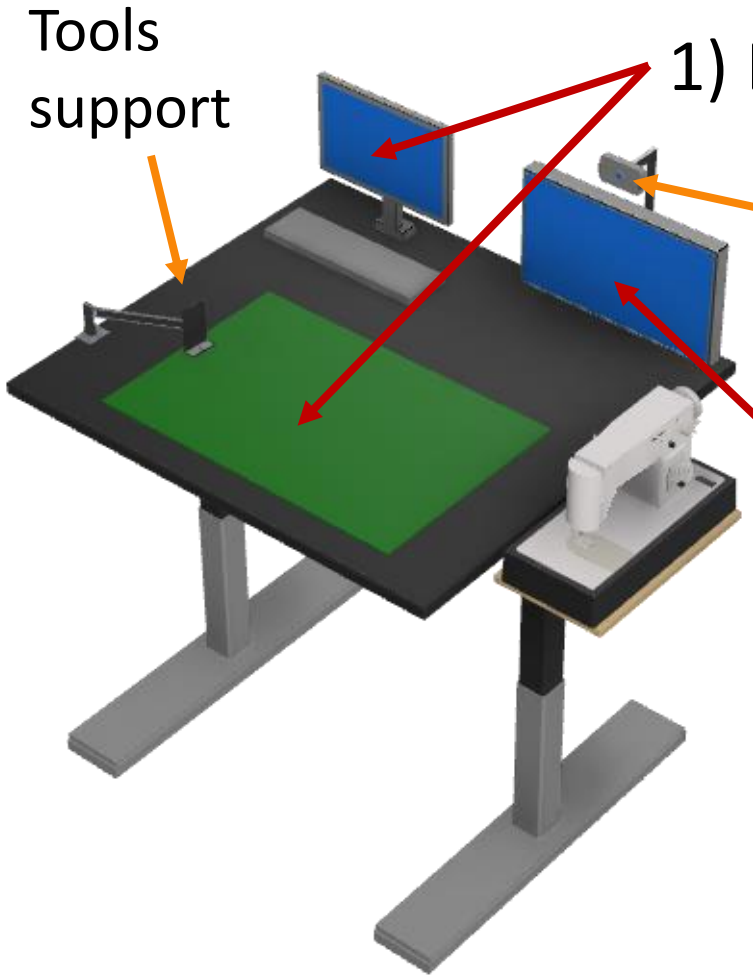
- Sewing machine
- Lighter
- Blowtorch
- Knight
- Cutter
- Small brush
- 2 iron tools
  (for grooving and sanding)
- Hammer
- Die cutter
- Sander
- Eyeletting machine
- Glue
- Cutting surface finishing agent
  (Japanese product **Tokonole**)

System overview

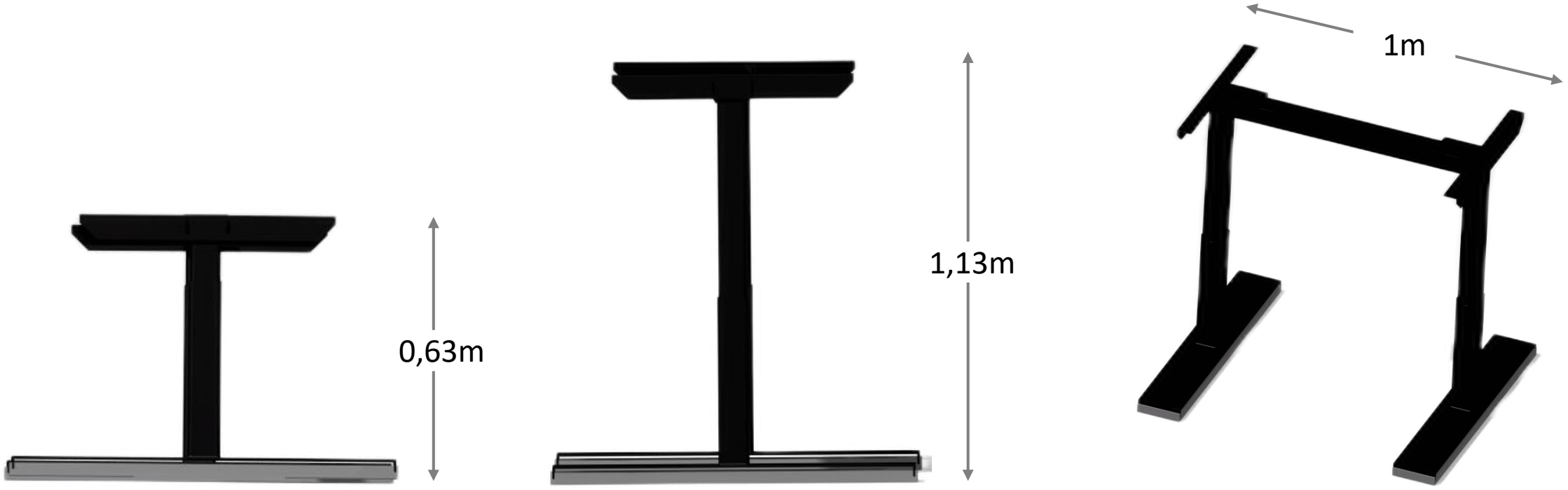
Skill transfer system design – 3D render

Desk

- Work area (cutting mat)
- Touch screen
- Computer
- Fixed sewing machine
- Support for tools



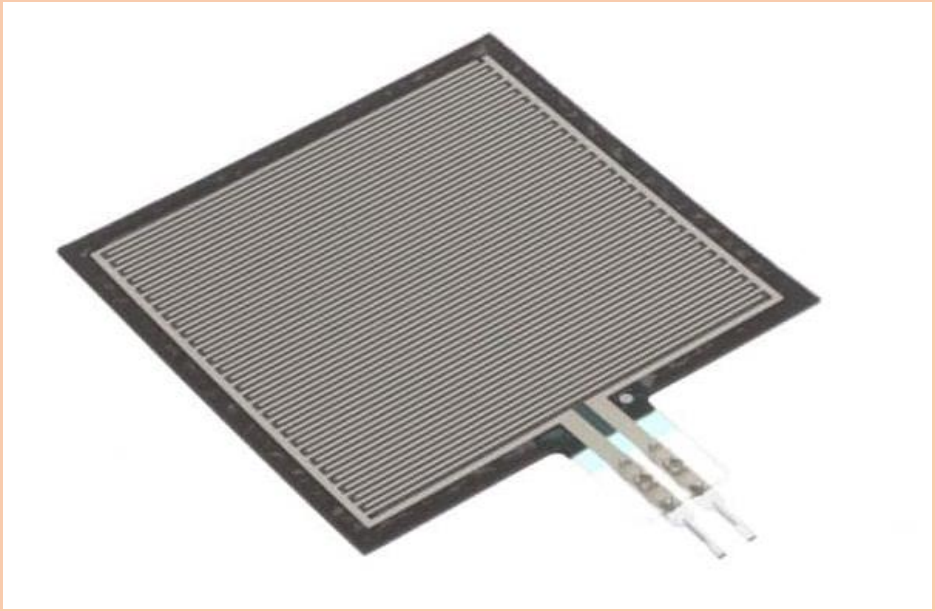
Skill transfer system design - legs



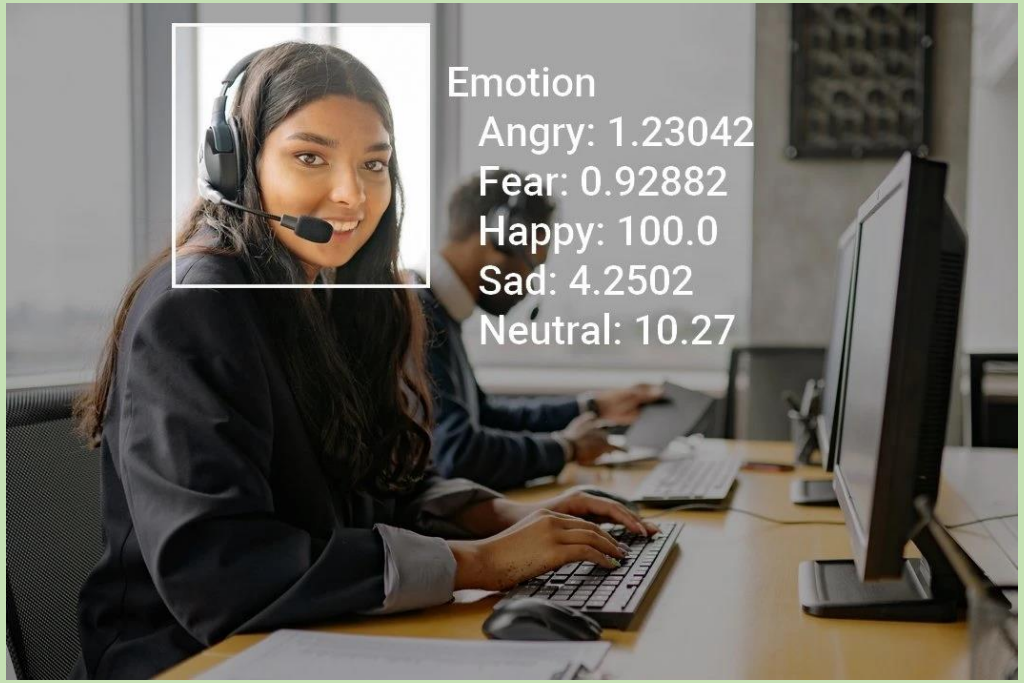
1) Digital assistance

- **Pressure sensor**

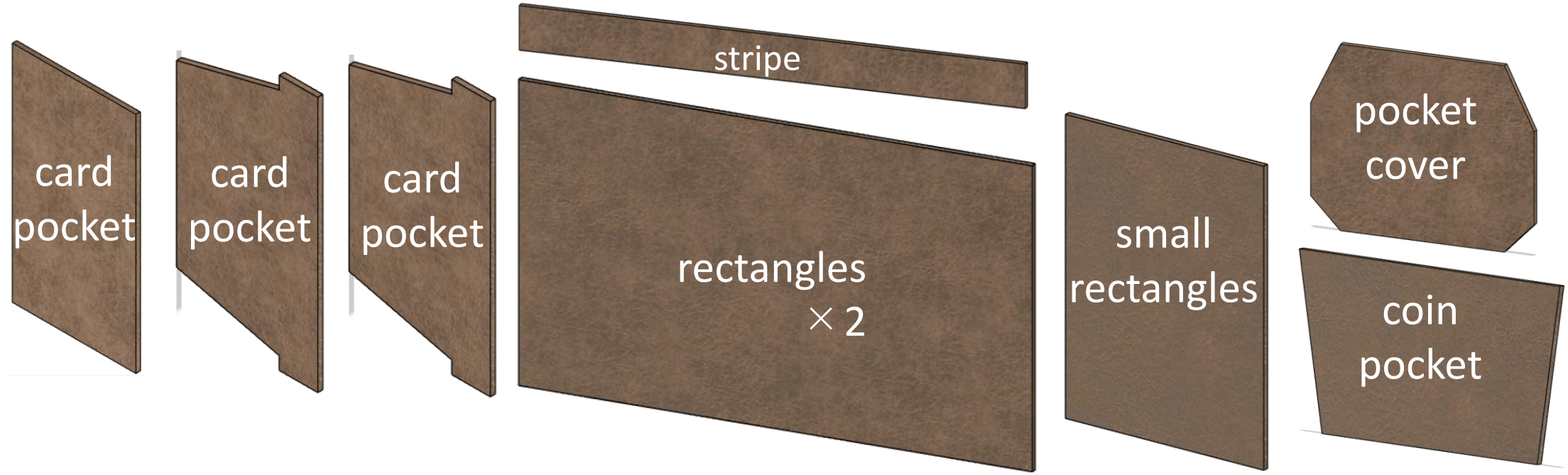
under the table both for learning and teaching



- **Emotion recognition software**

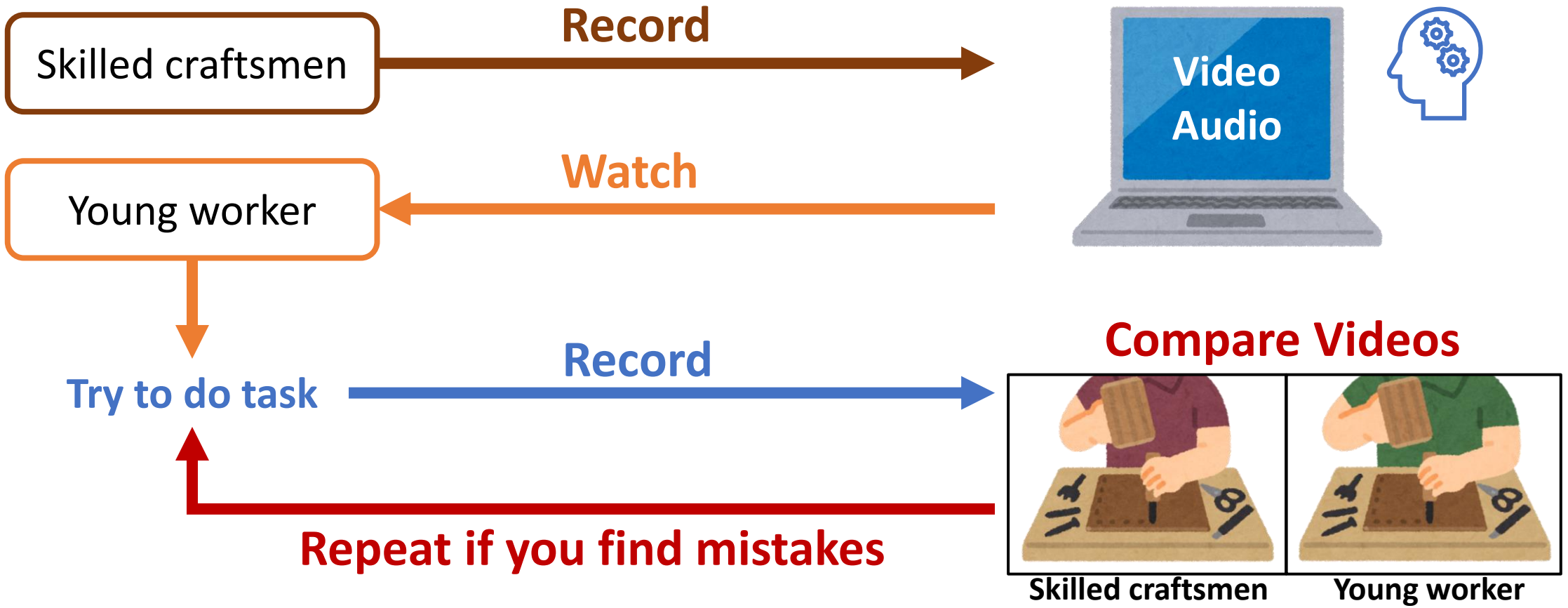


2) 3D virtualization - Leather pieces



These objects should be recognized by the software, with precise measurements

How to learn the techniques



Software overview

Object recognition pt.1

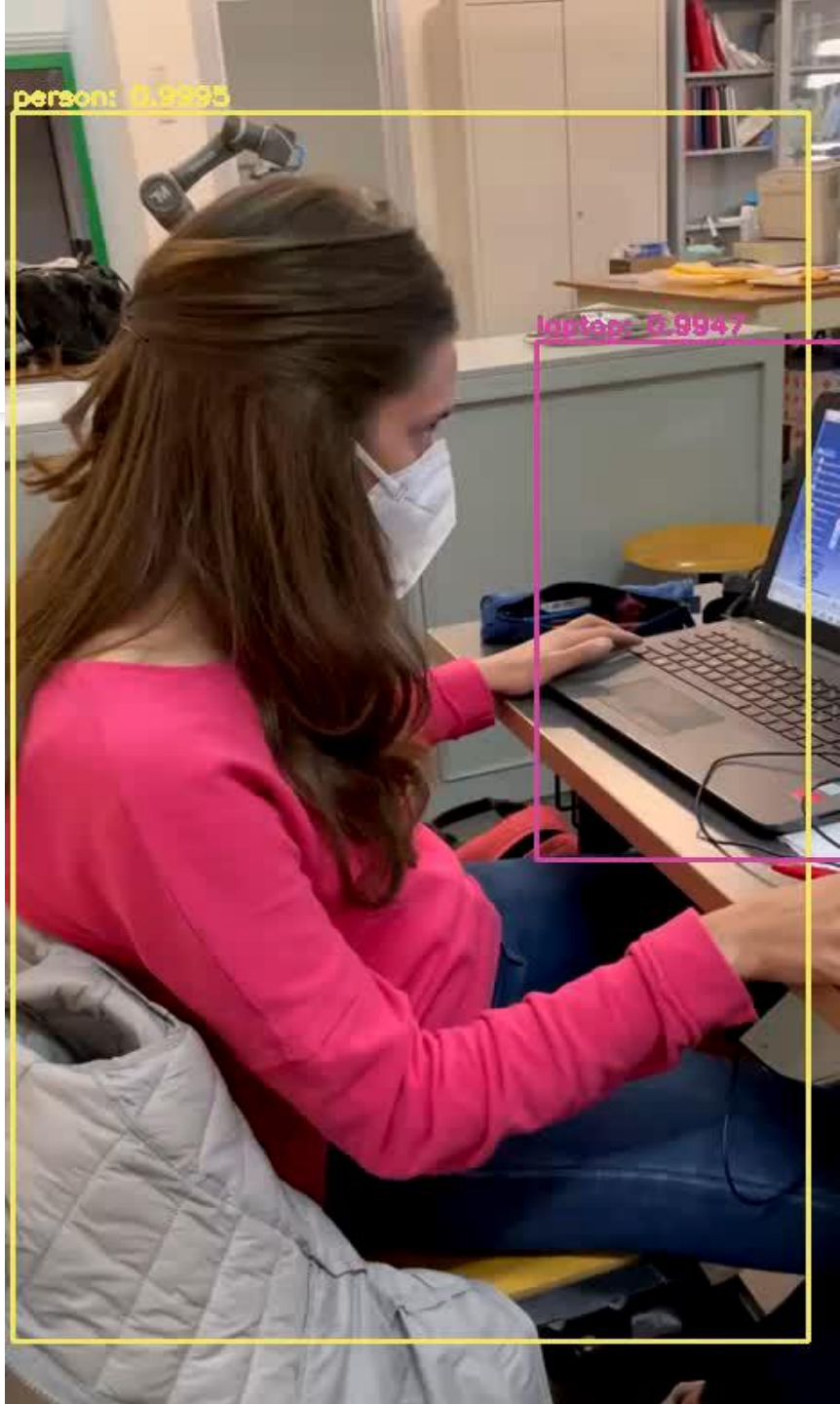
To learn how to assemble parts, first of all, the software has to recognise them!

We have realized a Python application for doing this (by photo)

Object recognition pt.2

In addition, the parts must be detected **by video**!

We extended the previous code, iterating it for each video frame

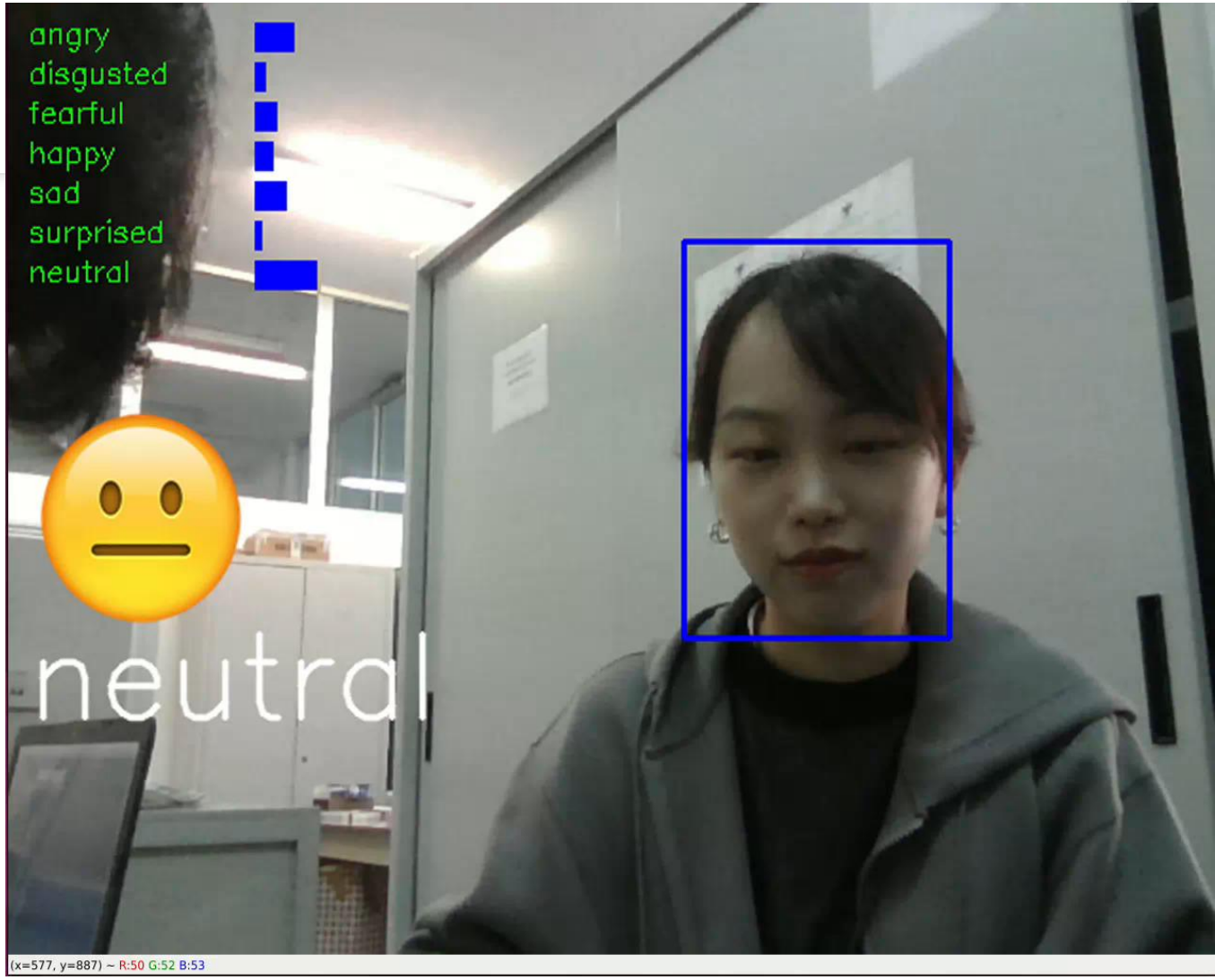


*video recorded with iPhone 12 pro, 1080p HD at 30fps

Emotion recognition

As we said, we would like to include an emotion recognition application in order to give a feedback, to the young worker

We made it!



Future development

1. Action and gesture recognition

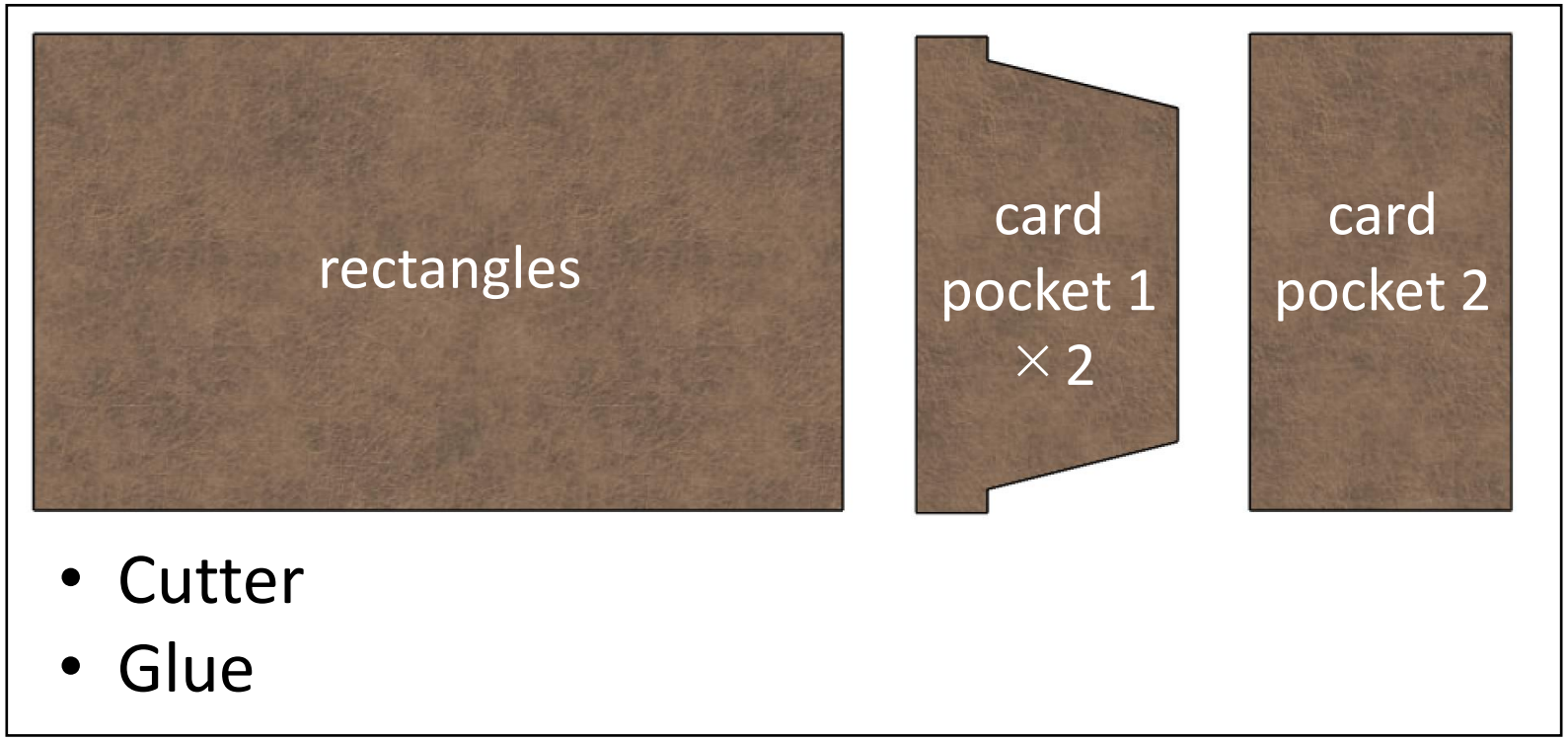
2. Virtualisation of the environment

3. Virtual replication of the learned process

Virtual 3D guide model

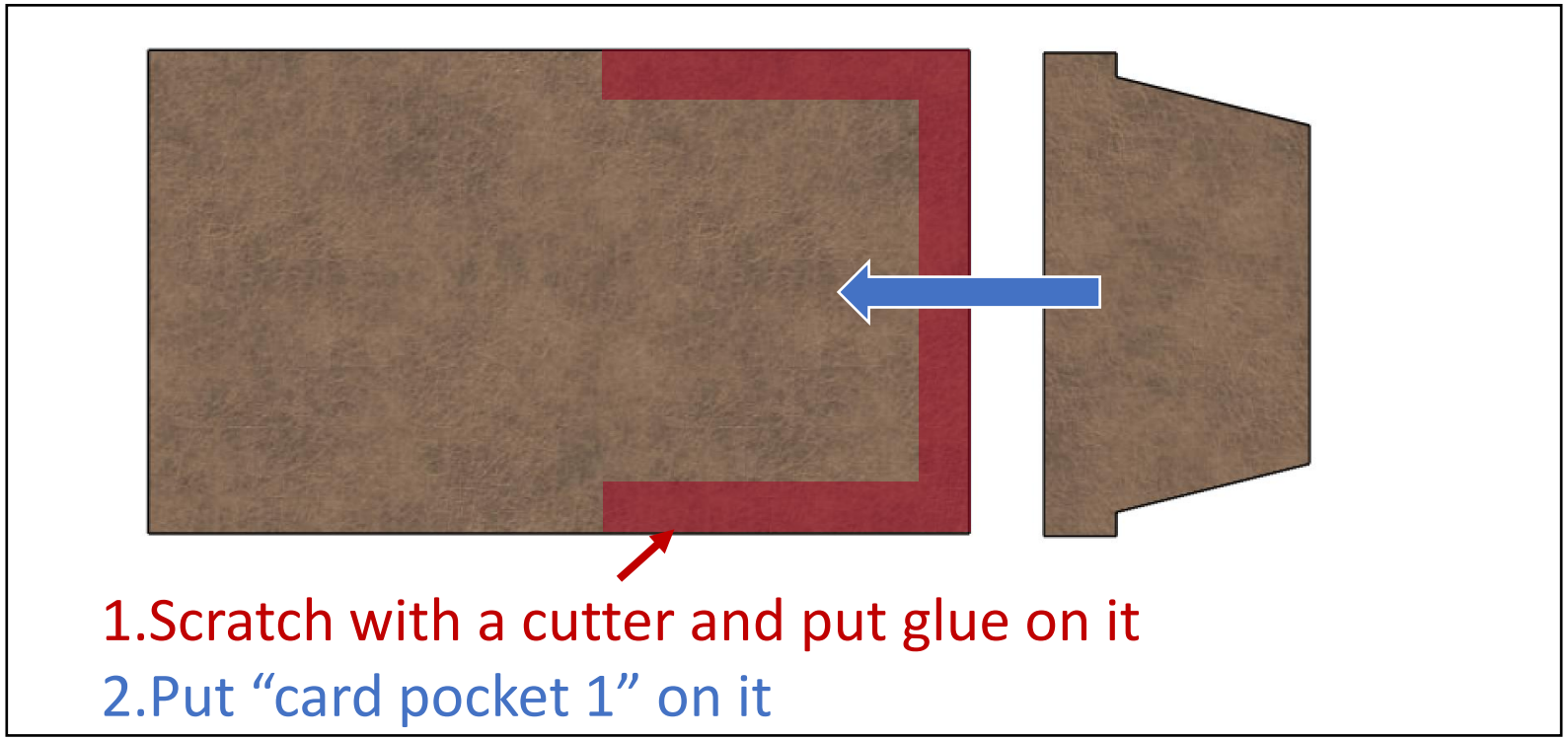
Virtual 3D guide - Step 1

- **Display what is needed for assembly**
  (Example : Assembling the card pocket)



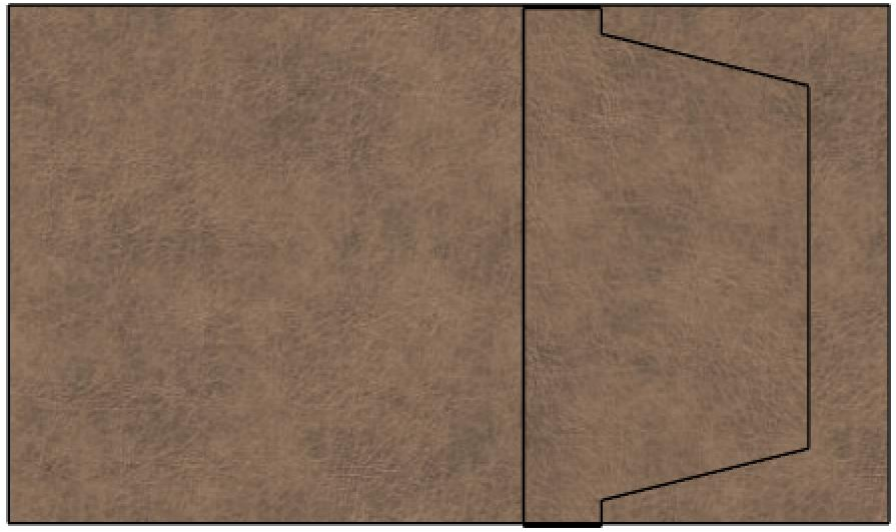
Virtual 3D guide - Step 2

- **Display what action you need**
  (Example : Assembling the card pocket)



Virtual 3D guide - Step 3

- **Display result in progress**
  (Example : Assembling the card pocket)



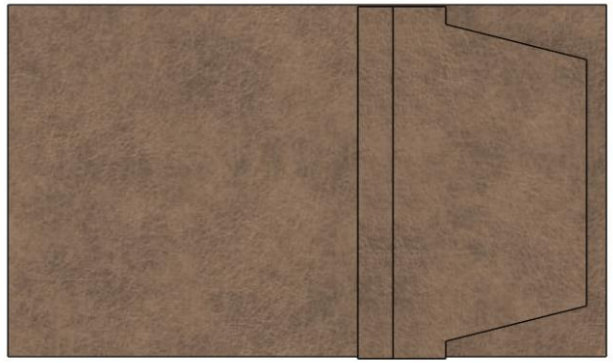
Next → put another “card pocket 1” on it

Virtual 3D guide - Step 4 and after

- **Display and guide assembly instructions in the same way.**
  (Example : Assembling the card pocket)

Result in progress

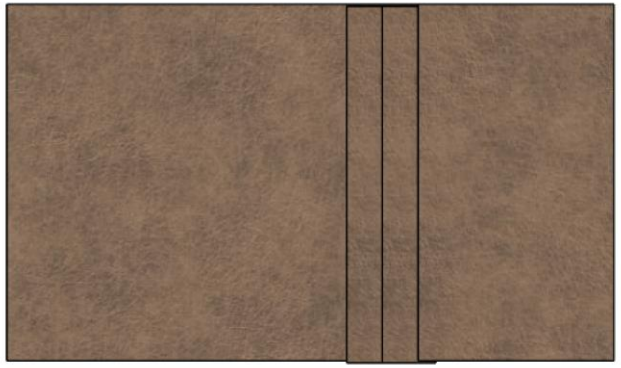
Guide assembly



Next → put “card pocket 2” on it

Guide assembly

Final result



Card pocket assembly complete!

Evaluation

Evaluation metrics

Benefits >>> We have already explained them

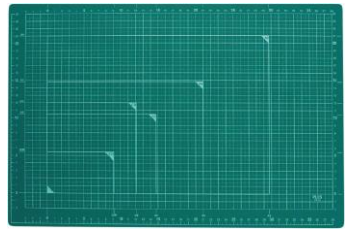
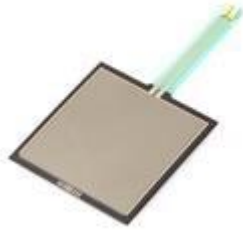
Novelty >>> We believe that our system is truly innovative,
indeed, with today's technology it is very difficult to realise

Energy >>> A computer charger (70W/h), a sewing machine (90W/h) and a monitor (30W/h) with a usage of 8 hours per day and considering 0.20€ per KWatt you will spend $\frac{0.20 \times 8 \times 190}{1000} = 0.304$ € per day

Universally designed >>> No prerequisites, everyone can use this system

Evaluation metrics - Costs

What you need for our proposal	Price	
	EUR	JPY
Working area (Cutting mat (PLUS A3 48584))	6.14 €	¥866
Pressure sensor (SparkFun Electronics(SEN-09376))	15.47 €	¥1,739
Touch screen (15.6inch)(Boway GS156AT1)	205.21 €	¥27,990
Web camera (Buffalo BSW505MBK)	21.67 €	¥2,987
Sewing Machine (Janome LC7500K)	311.93 €	¥43,000
Desk (tectake AAA0000911352)	419.95 €	¥59,242
Total	**980.37 €**	**¥135,824**

*Computer → If you already have it, no need to buy new one

Other evaluation methods of this system

Comparison of time required

- **Time to do the task** (before and after learning)
  →You can see how much the young craftsmen have grown

- **Time to train young craftsmen** (before and after system implementation)
  →Skilled craftsmen can make other products in their free time

Conclusion

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- We proposed **a desk and supporting software** to easily learn how to make leather wallets.
- By using the system we propose, **young workers can learn the skills on their own**.
- Our system can be used for **repairing leather products** except for manufacturing leather products.
- Our final goal is **the young workers' skills should improve** until the system we proposed is no longer needed.