SUMMARY OF PROJECTS

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Project 1 “DeteCtor” EDF Renouvelables Solar Panel Micro-Crack Detection System

- Based on deep learning, computer vision

Project 2 Human pose recognition

- Machine coach for self-practice

Project 3 Face recognition camera based on Android

- Photography software for the blind people

Project 4 White light source with adjustable color temperature

- Designed for medical field

Project1: “DeteCtor” EDF Renouvelables Solar Panel Micro-Crack Detection System

Introduction:

This project is a computer vision project that I completed independently during my EDF graduation internship.

The goal is to use deep learning techniques to identify and locate PV micro-cracks with various shapes and sizes and finally achieve the purpose of automatic detection of solar panels Electroluminescence images.

Keywords:

Deep learning, micro-cracks, image processing, Intelligent detection, Convolution Neural Network

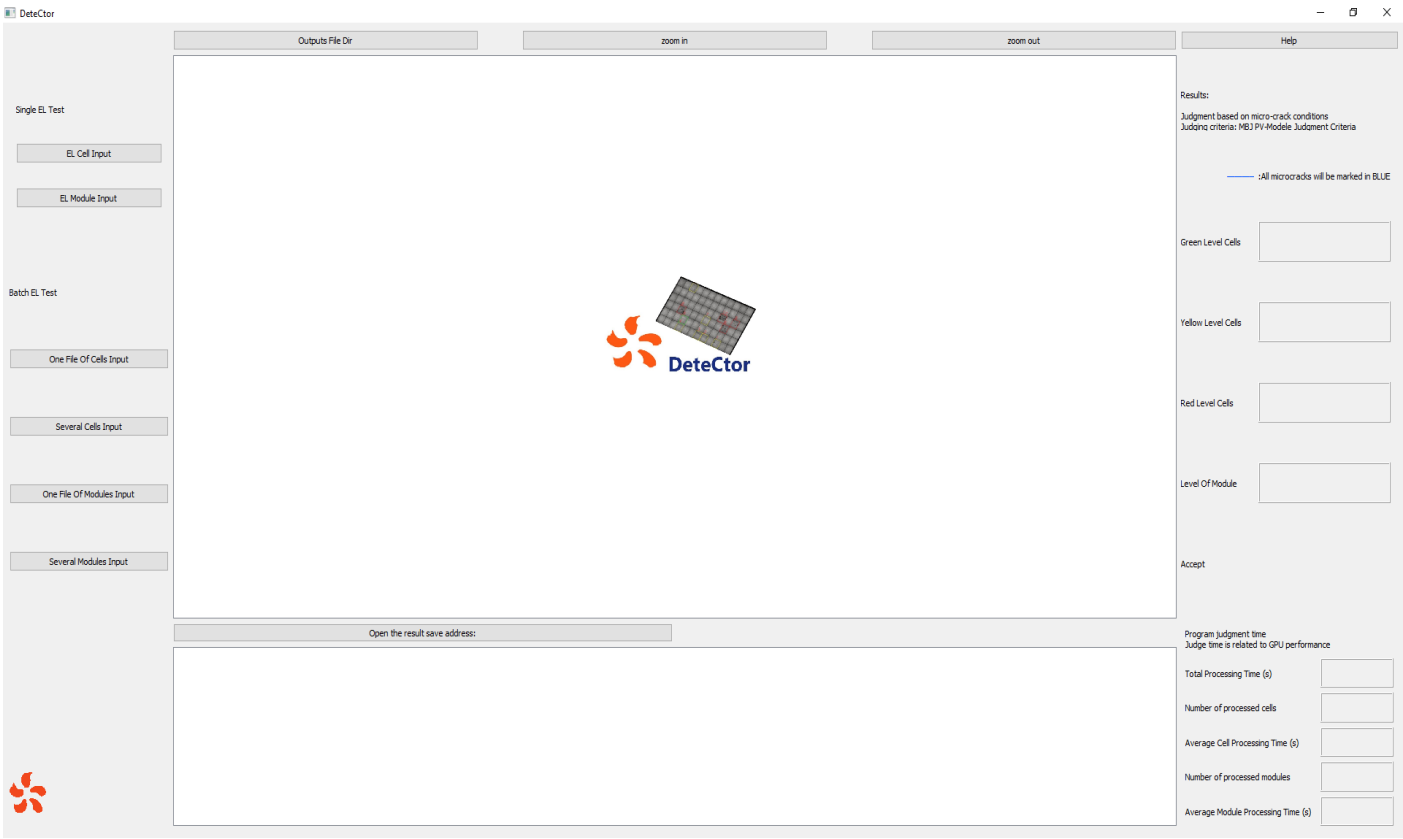

Figure1-1 User interface of “DeteCtor”

Project1: “DeteCtor” EDF Renouvelables Solar Panel Micro-Crack Detection System

Achievement:

- Detection and localization of micro-cracks at the cell level (Accuracy = 98.6%)
- Good adaptability to different types of solar panels (Monocrystalline silicon, polycrystalline silicon, different number of busbars)

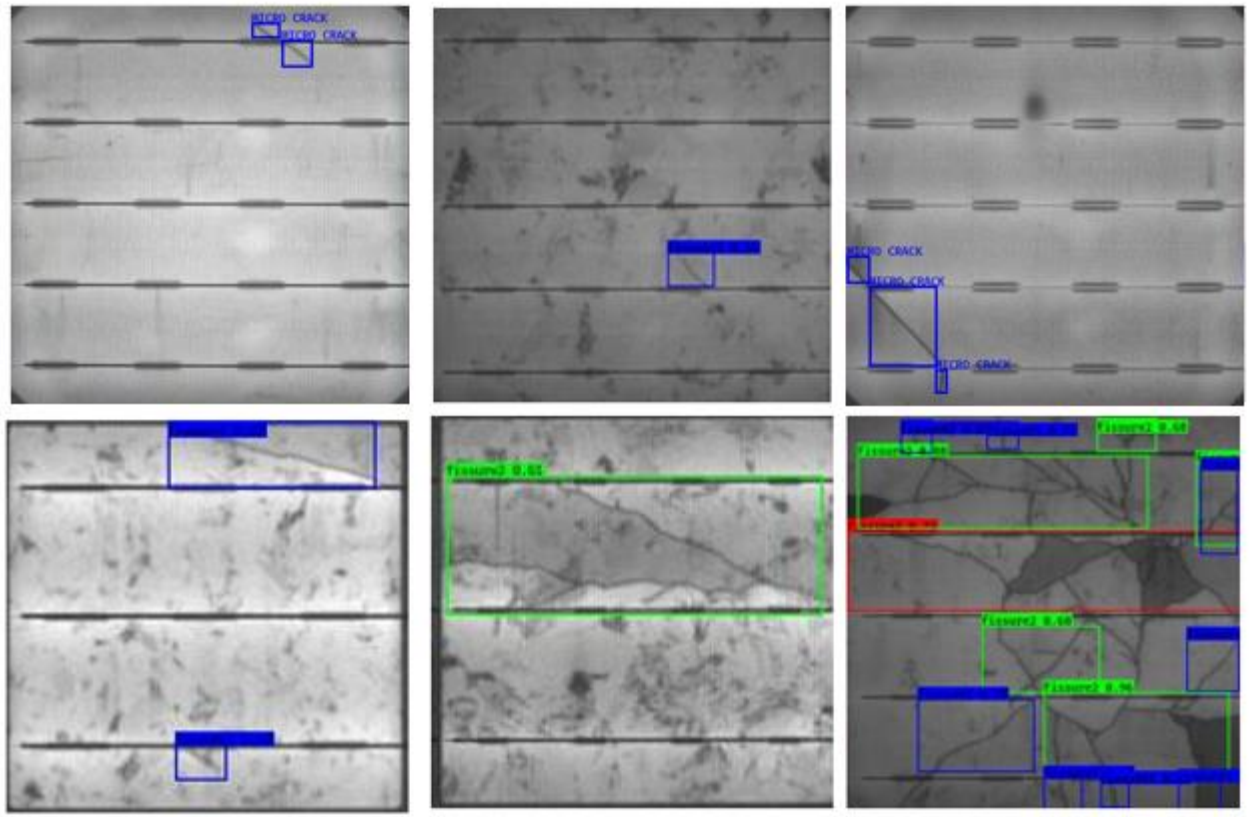

Figure1-2 Good detection results for different types of solar panels

Project1: “DeteCtor” EDF Renouvelables Solar Panel Micro-Crack Detection System

Achievement:

- Automatically cut and rate solar panels at the module level
- Automatically adapt different models of modules (6*10, 6*12)
- User interface

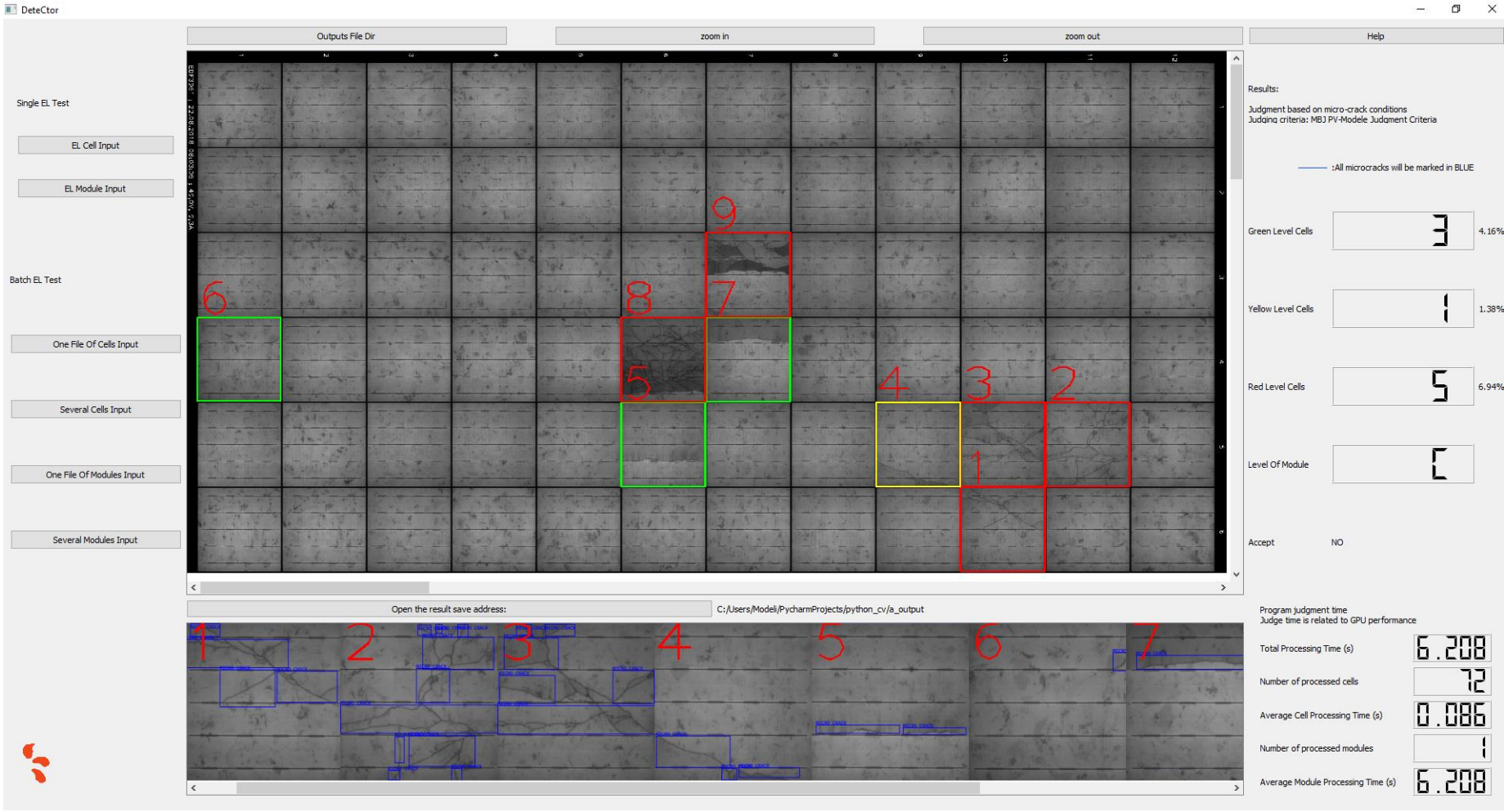

Figure1-3 Detection of the module level, includes rating information, time information, etc.

Project1: “DeteCtor” EDF Renouvelables Solar Panel Micro-Crack Detection System

Achievement:

- A large number of tests will automatically generate reports *(tab.1-1)*
- Optical distortion correction for adapting more production lines *(fig.1-4)*

	A	B	C	D	E	F
1	Module	Level	Green Cells	Yellow Cells	Red Cells	Accept
2	EDF3858_be:	A	1	0	0	YES
3	EDF3869_be:	A	4	0	0	YES
4	EDF3870_be:	B	3	1	0	YES
5	EDF3874_be:	A	0	0	0	YES
6	EDF3878_be:	B	2	2	0	YES
7	EDF3897_be:	A	2	0	0	YES
8	EDF3900_EL	A	3	0	0	YES
9	EDF3924_be:	A	0	0	0	YES
10	EDF3925_be:	A	0	0	0	YES
11	EDF3926_be:	A	0	0	0	YES
12	EDF3933_be:	A	3	0	0	YES
13	EDF3934_be:	B	5	1	0	YES
14	EDF3935_be:	B	5	1	0	YES
15	EDF3936_be:	B	1	3	0	YES
16	EDF3937_be:	B	2	1	0	YES
17	EDF3938_be:	A	2	0	0	YES
18	EDF3939_be:	A	0	0	0	YES
19	EDF3940_be:	B	4	1	0	YES
20	EDF3941_be:	B	3	1	0	YES
21	EDF3949_be:	C	3	3	1	NO
22	EDF3950_be:	C	2	1	1	NO
23	EDF3951_be:	C	3	1	5	NO
24	EDF3952_be:	D	8	8	7	NO
25	EDF3953_be:	C	2	4	5	NO
26	EDF3965_be:	B	9	4	0	YES
27	EDF3970_be:	B	3	6	0	YES

Table1-1 Test report example

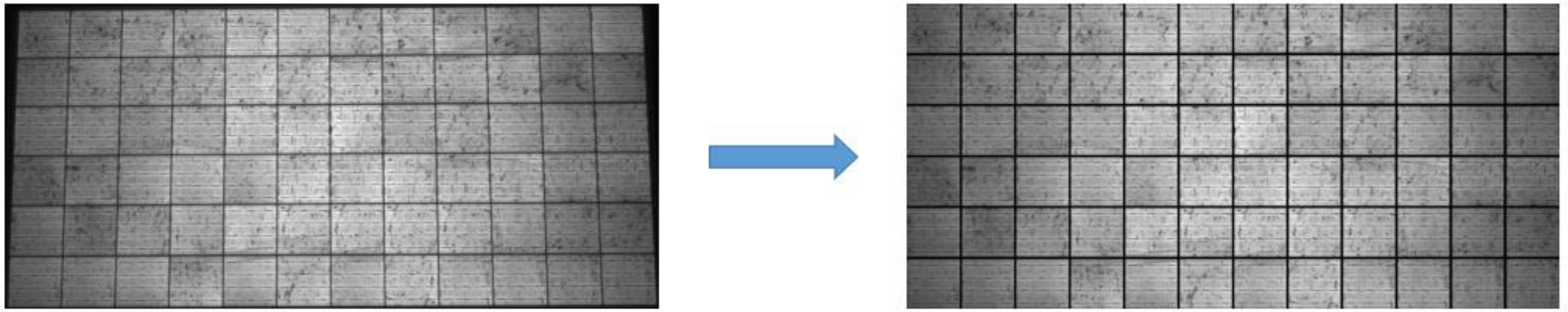

Figure1-4 Optical distortion correction
Unprocessed image on the left and corrected image on the right

Project1: “DeteCtor” EDF Renouvelables Solar Panel Micro-Crack Detection System

Technical Information:

Test data: 12,000 images

Test accuracy: 98.6% (F1 score = 0.948)

Running speed: 0.104s/image with GPU GTX980M

- Image Processing:
  OpenCV, Edge detection, Image normalization, Optical distortion correction
- Deep learning:
  Keras, Tensorflow, Yolov3, Target detection convolutional neural network
- Data processing and visualization:
  Numpy, Pandas, Matplotlib
- Interface development:
  PyQt5, QtDesigner
- Development Platform:
  Python3.6, Pycharm

Project2: Human pose recognition

Introduction:

This project is a image processing project that I completed independently during my master's studies.

The detection of the human body posture is completed by deep learning technology. The posture will then be compared with the standard action.(For example, gymnastics, martial arts). The software will eventually help the learner to correct the exercises themselves.

Keywords:

Image processing, Human pose, Artificial intelligence coach

Figure2-1 The standard posture selected by this project---Horse stance

Project2: Human pose recognition

Achievement:

- Through the modification and adaptation of the existing deep learning model, the key points of the human body posture required by the project are successfully obtained.
- Successfully judge whether the action is standard and give corresponding suggestions *(fig.2-3)*

Technical Information:

Test success rate: 90%

- Image Processing:
  OpenCV, Edge detection, Image normalization
- Deep learning:
  Modify and adapt the existing model
- Data processing and visualization:
  Numpy, PIL, Matplotlib
- Development Platform:
  Python3.6, Geany

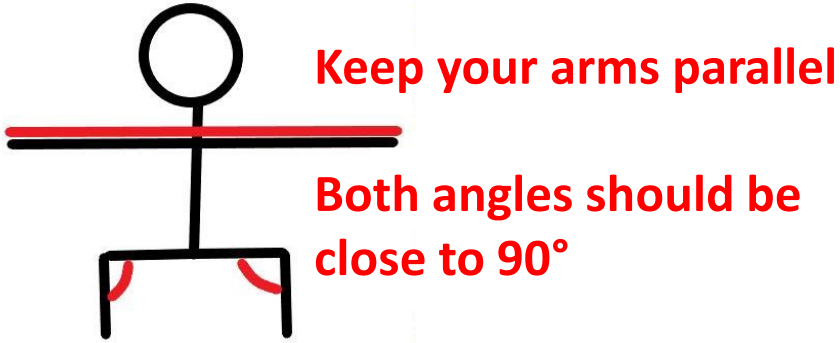

Figure2-2 Judgment criteria for action

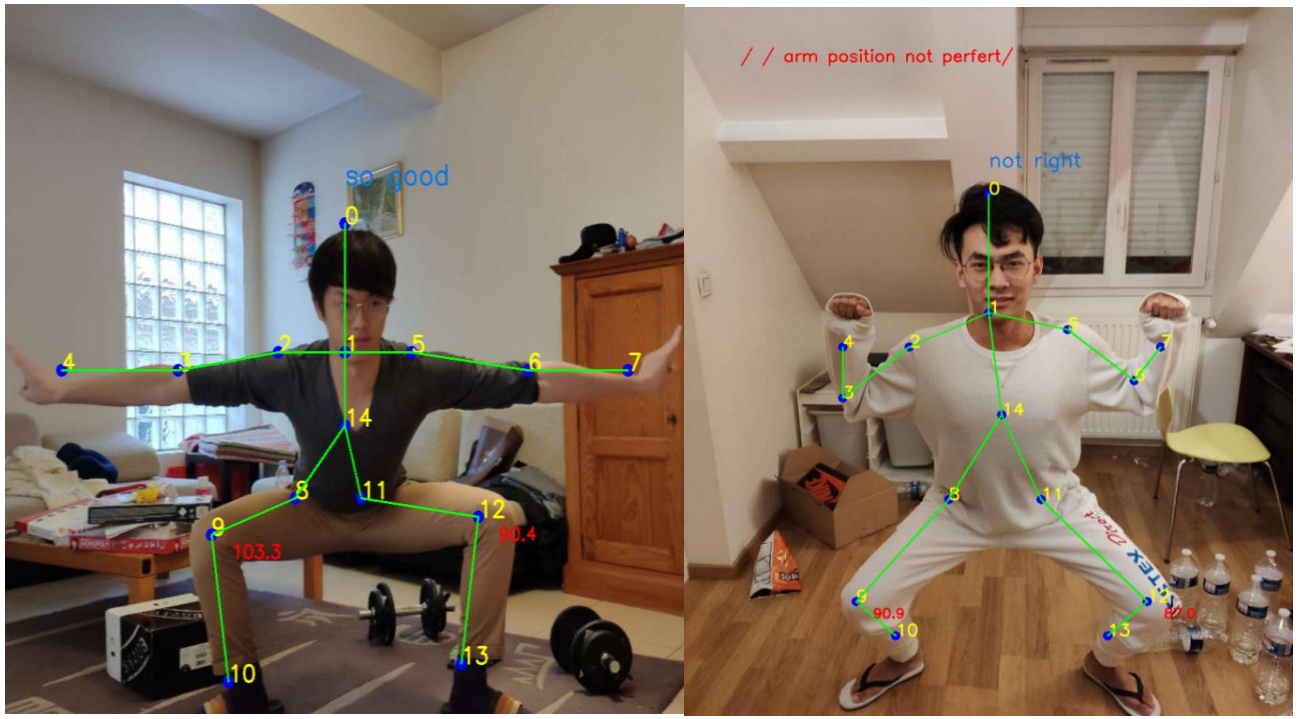

Figure2-3 The left side is a standard-compliant action. The right side is an action that does not meet the standard, and the software gives action suggestions.

Project3: Face recognition camera based on Android

Introduction:

This project is a personal professional project in the final year of the master's degree.

The goal of the project is to develop an automatic camera software for the blind based on face recognition technology, so that blind people can also take high quality photos for the friends.

Keywords:

Face recognition, Android, Automatic camera software

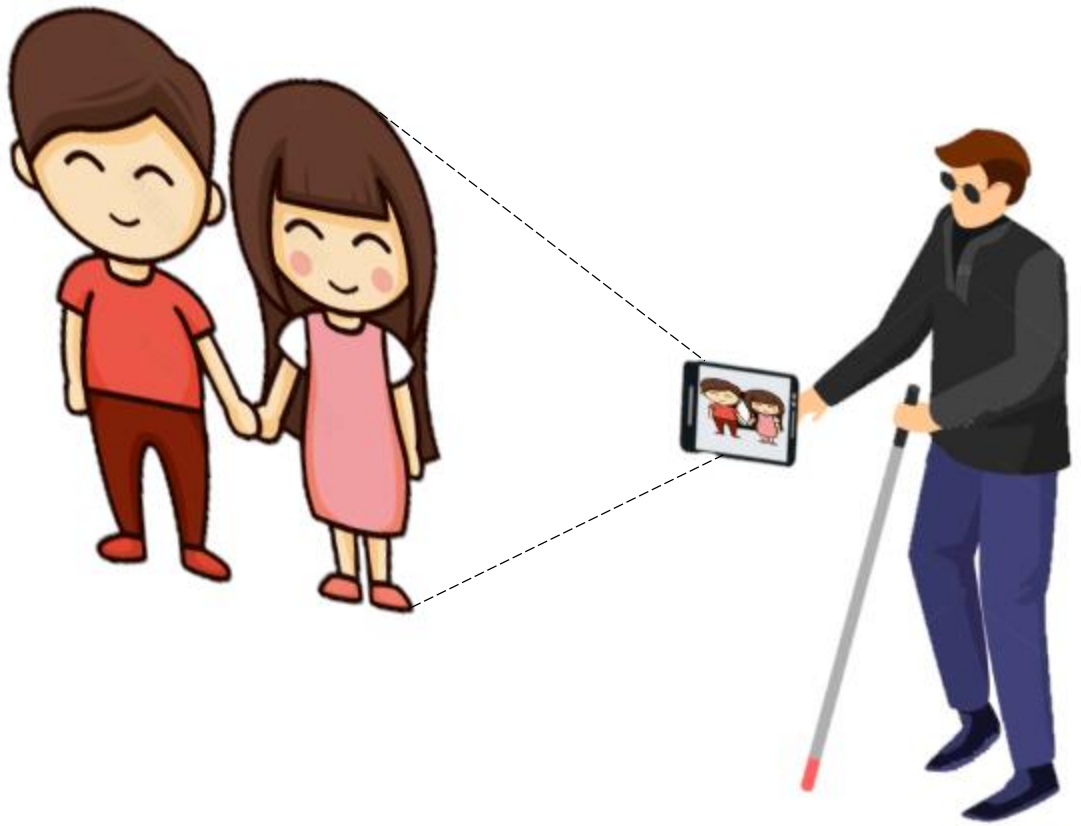

Figure3-1 Photographic software that blind people can use

Project3: Face recognition camera based on Android

Achievement:

- The recognition of the face is successfully realized on the Android phone, and the automatic photography is performed according to the position of the face.
- It fits well with the blind mode of Android phones. The blind person can operate the software independently through voice prompts.
- Develop a multi-person camera mode

Technical Information:

Project score: 16/20 (Class average score: 12.96/20)

- Image Processing:
  OpenCV, Image normalization
- Development Platform:
  Java, Android Studio

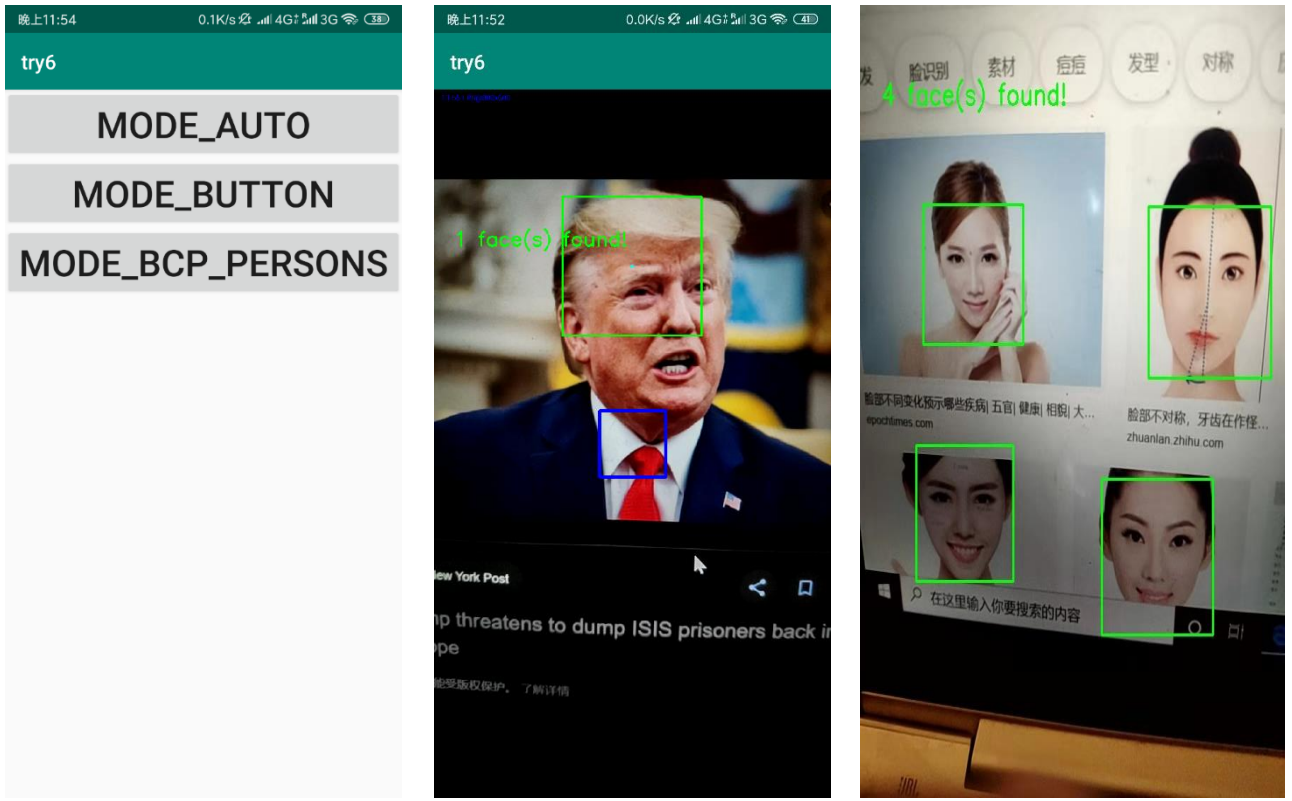

Figure3-2 From the left, the software main interface, automatic camera mode, multi-person camera mode

Project4: White light source with adjustable color temperature

Introduction:

This project is a group (7 students) project in the first year of the master's degree.

The goal of the project was to design a white light source whose color temperature is adjustable. The applications of such a device would be for the medical field. It could be used to distinguish fine details on a human skin which would be invisible with a natural light.

Keywords:

Led, Adjustable color temperature, Circuit design, 3D device design

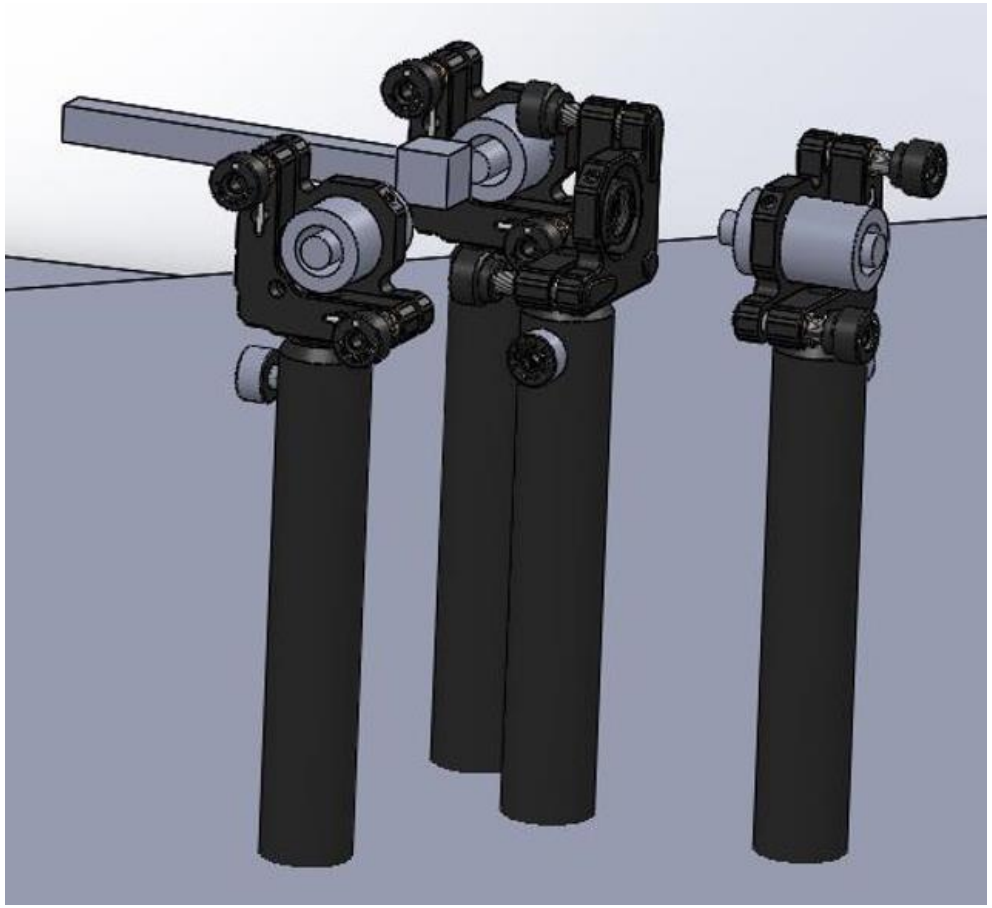

Figure4-1 System schematic

Project4: White light source with adjustable color temperature

Achievement:

- Completed the design and implementation of the led control circuit *(fig.4-2)*
- Complete 3D device design and 3D printing *(fig.4-3)*
- Optimize the position and angle of three light sources using MATLAB *(fig.4-4)*

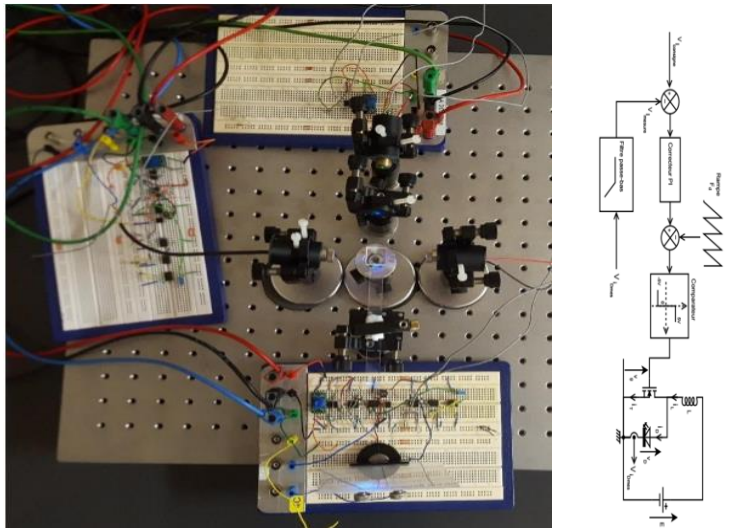

Figure4-2 Design and implementation of the led control circuit

Figure4-3 Parts obtained by 3D printing

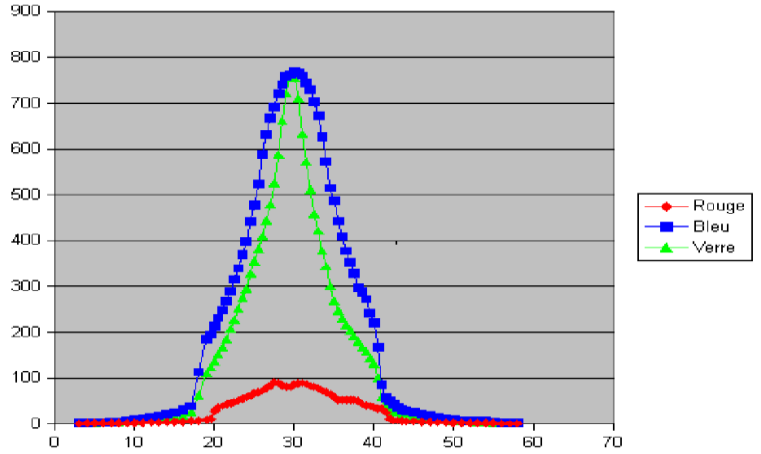

Figure4-4 Data simulation using Matlab

Project4: White light source with adjustable color temperature

Achievement:

- 3 primary color aliasing by optical cube and kaleidoscope *(fig.4-5)*
- A white light source with adjustable color temperature is realized *(fig.4-6)*

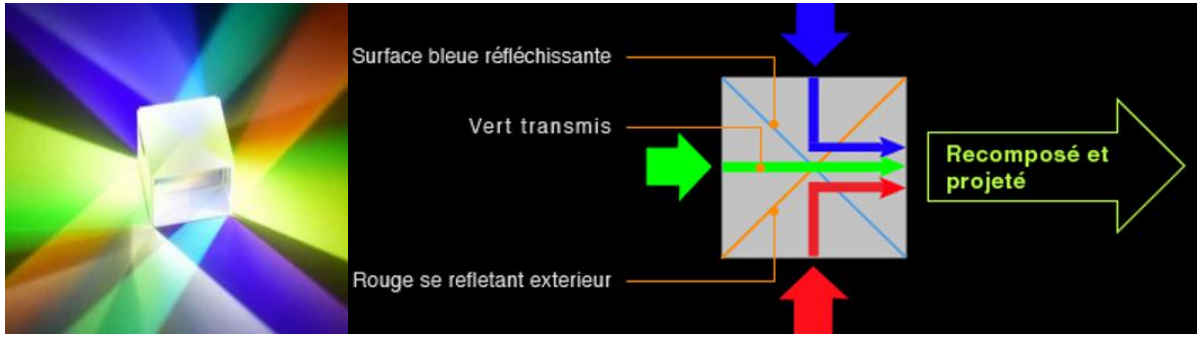

Figure4-5 Optical cube

Technical Information:

- Optical system:
  Refraction, dispersion, laser diode, lens, optical cube
- Industrial design:
  Solidworks, 3D printer
- Circuit design:
  Altium Designer
- Data simulation and optimization:
  Matlab

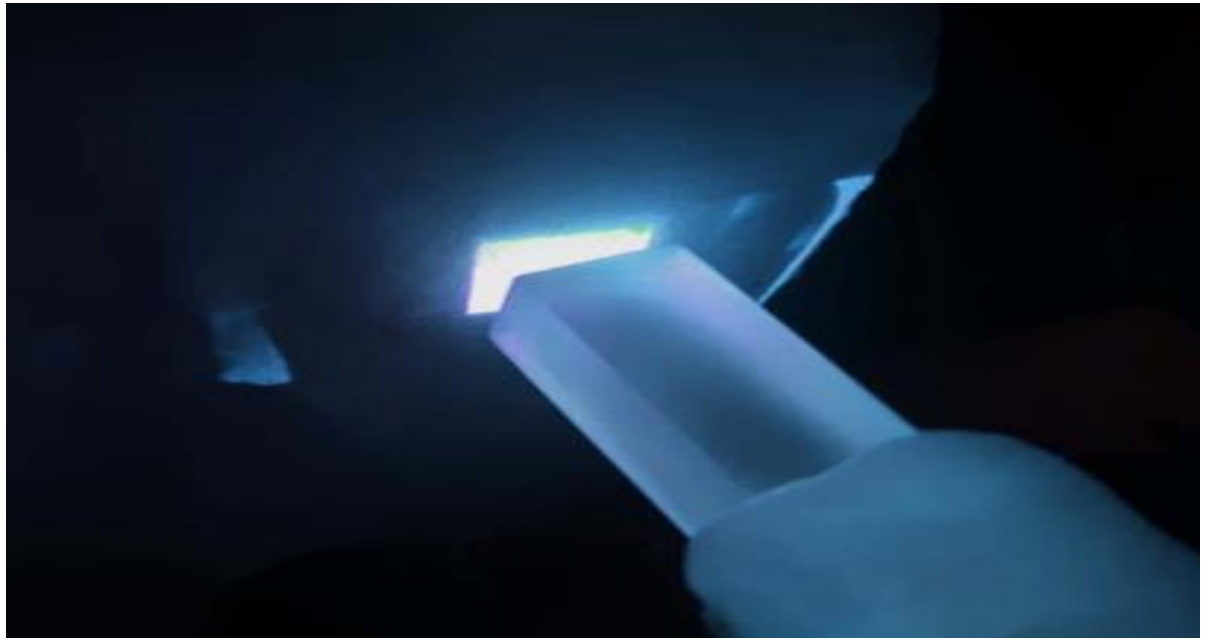

Figure4-6 Final white light source