

MOTIVATION

- Weather radar is a device that can observe atmospheric phenomena with high resolution, and continuous monitoring and equipment maintenance are required to maintain this high resolution. However, 24 hours a day / 365 days a year monitoring is impossible. So, in order to automatically perform such continuous monitoring as a human would, we tried to apply computer vision technology.

USED LANGUAGE AND LIBRARIES

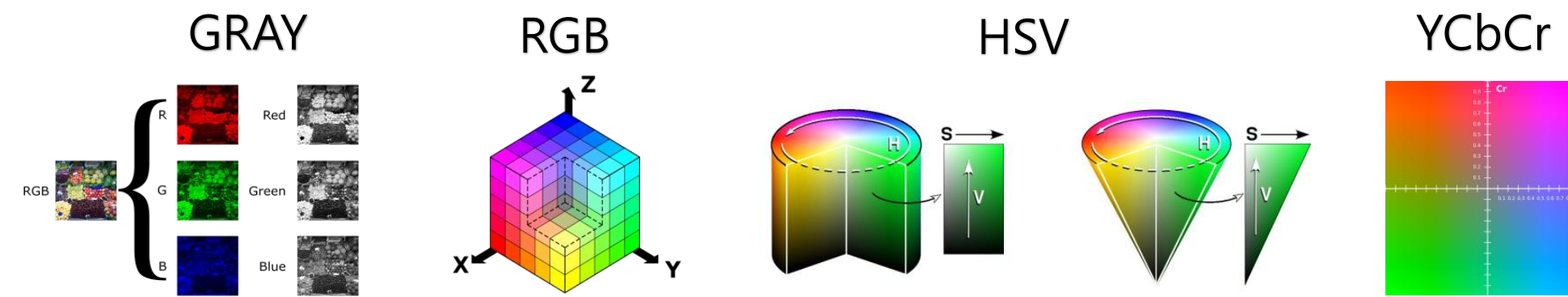
- Python ,OPENCV, Numpy, Pandas

COMPUTER VISION

- Computer vision is the study of methods to extract meaningful information from still images or moving images using a computer. It is a study that allows computers to perform equally what humans perceive with their eyes. It is a task that replaces the role of the human eye with a camera or input image and allows the computer to perform the role of the brain through a mathematical algorithm.

COLOR MODEL

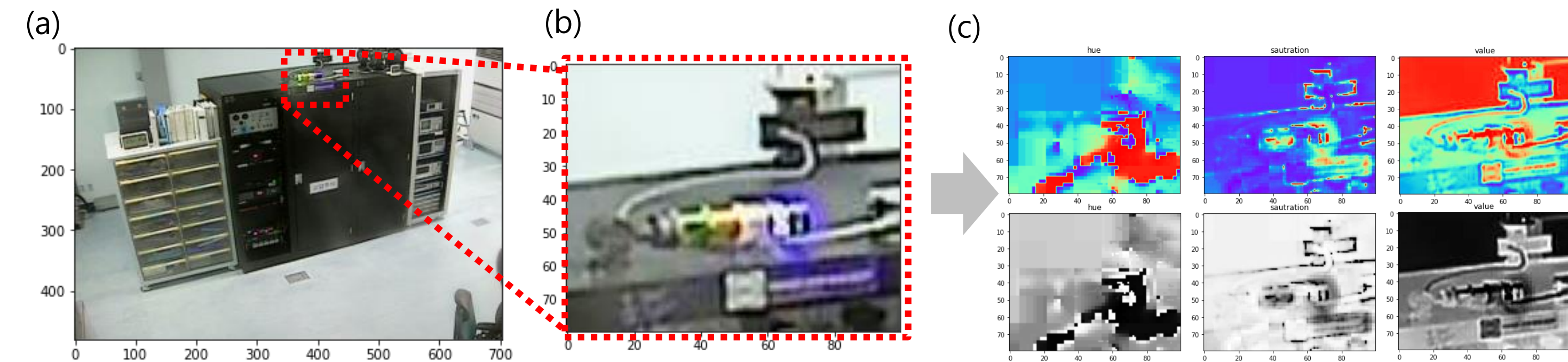
- The color model is divided into Gray RGB, HSV, YCbCr, etc. according to the purpose of use, and each color model is selected and used according to the purpose of use.



EXAMPLE OF USE

CASE 3

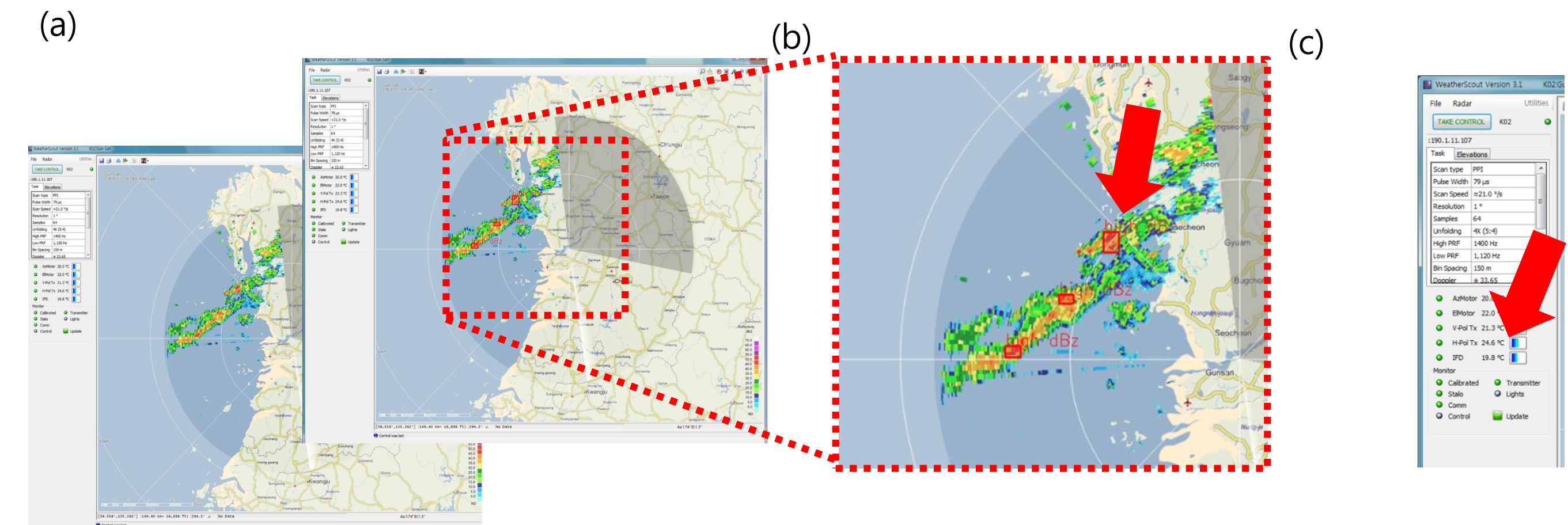
- Checking the red alarm signal of the physical lamp is the fastest way to determine whether radio waves are actually transmitted or not, independent of the radar data generation. As shown in the figure, when the red lamp of the alarm lamp at the top of the radar shelter turns on, it means that there has been a failure in the transmission of radio waves. This can be utilized to generate an alarm when a red color occurs by using HSV.



- Fig(a) Radar control room CCTV image
- Fig(b) Red rectangle : Cropped alarm signal of physical lamp image
- Fig(c) Fig(b) Split by HSV image

CASE 4

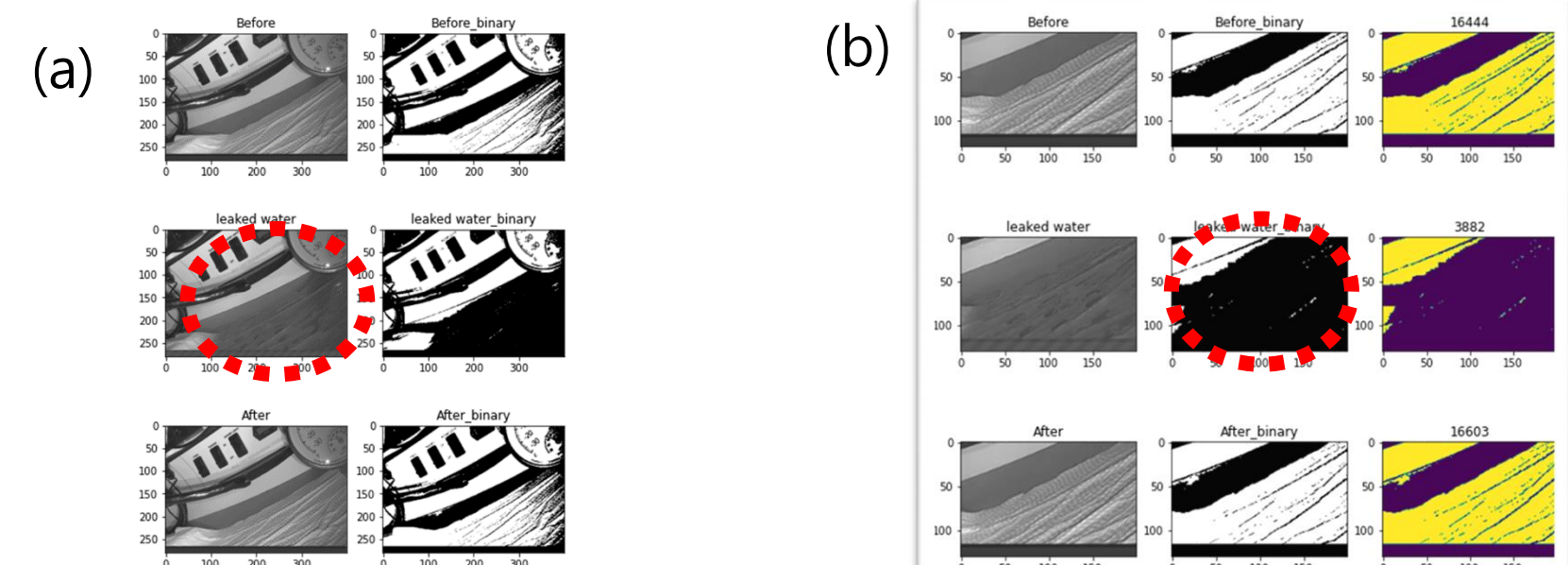
- When DBZ of a certain intensity or higher occurs on the screen of a real-time operation program used for radar operation, colors are classified based on HSV, and an alarm signal can be generated when an echo occurs in a specific color or pixel.
- In addition, you can check the equipment temperature and equipment status with OCR and pixel information through the screen image provided by the real-time program.



- Fig(a) Real time operation program image and specific reflectivity detection using OPENCV
- Fig(b) Red rectangle : Cropped specific reflectivity detection image from Real time operation program
- Fig(c) Real time status information provided by the real time operating program

CASE 1

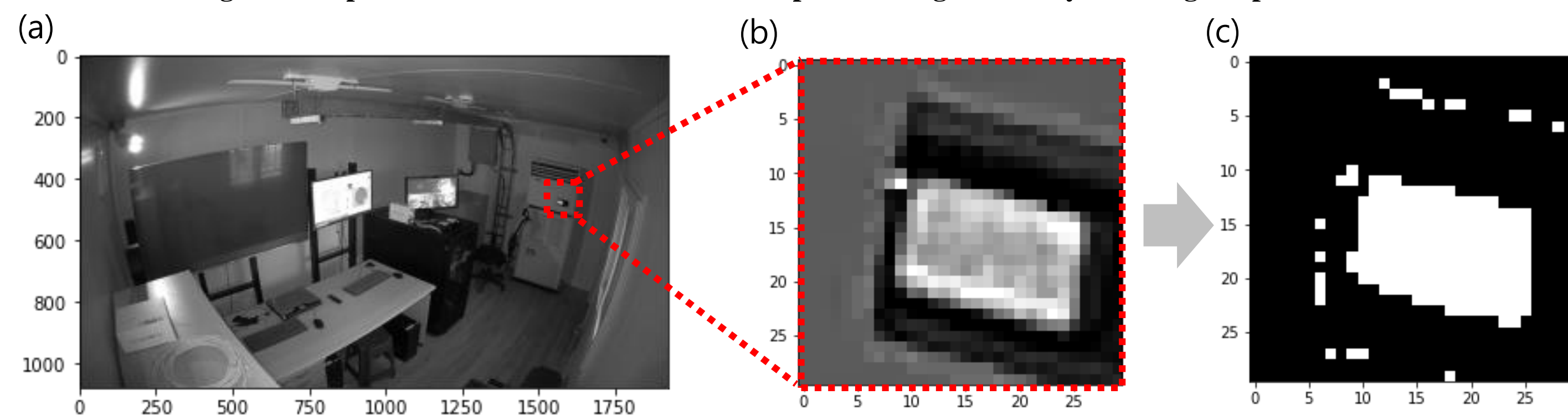
- It operates based on the real-time streaming video transmitted from the CCTV in the radome, and based on the brightness of the video, the number of pixels of the brightness that changes when leaked water occurs is used to determine whether or not to be submerged.



- Fig(a) Red circle : Check for leaks
- Fig(b) Check the number of bright pixels

CASE 2

- Basically, the radar operates with the UPS, and a power outage does not cause an immediate shutdown of the equipment.
- However, if the power outage is prolonged, it is necessary to perform a planned stop for the safety of the equipment.
- This blackout alarm is also operated based on real-time streaming video transmitted from CCTV in the control room. At this time, with the LCD window of the air conditioner receiving constant power as the reference point, "Binaryzation" is set as shown in the figure. It is possible to check whether there is a power outage or not by checking the pixel fluctuations.



- Fig(a) Radar control room CCTV image
- Fig(b) Red rectangle : Cropped air conditioner LCD image
- Fig(c) Fig(b) Binaryzation image

Summary and Conclusion

- Radar monitoring using opencv can be used in various ways, and even if it is not the method given above, if you understand and use the color model, it can be used for radar monitoring in various ways.

Acknowledgement

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