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Evaluation of disinfection activities using thermal camera

Were you able to thoroughly disinfect the entire area?

Abstract

We propose a visualization system to verify wipe disinfection status on surfaces such as a safety cabinet. In wipe disinfection, disinfectants such as alcohol are sprayed onto the surface and wiped off with sufficient pressure to remove cells and bacteria. Our proposed method evaluates wipe disinfection process using a thermal camera and pressure sensors. The thermal camera captures sprayed disinfectant on surfaces by detecting a reduction in surface temperature due to its evaporation. The pressure sensor measures the applied pressure during wiping. By combining these data, our system visualizes the area that was sufficiently sprayed with disinfectant and wiped with enough pressure. In medical situations, including regenerative treatment, complete disinfection of the entire area is essential. However, wipe disinfection has been performed according to the manual, and methods for verifying disinfection results are limited. In contrast, our system enables users to improve disinfection treatment by understanding disinfection results and to achieve an environment where users can work safely to disinfect. We aim to contribute to improving medical safety and efficiency.

Wipe disinfection treatment

- Disinfection is essential treatment for preventing infection
- Disinfection is mandatory for each patient in regenerative medicine
  - Preventing contamination

Challenge 1: Insecurity in disinfection
Thoroughly disinfected?
Difficulty to improve efficiency

Challenge 2: Inefficiency in disinfection
Discontinuation of use until all cells and bacteria are eliminated

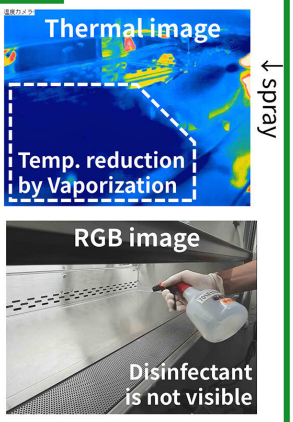
Visualization of wipe disinfected area

- Contributing to improve treatment safety and reduce workload

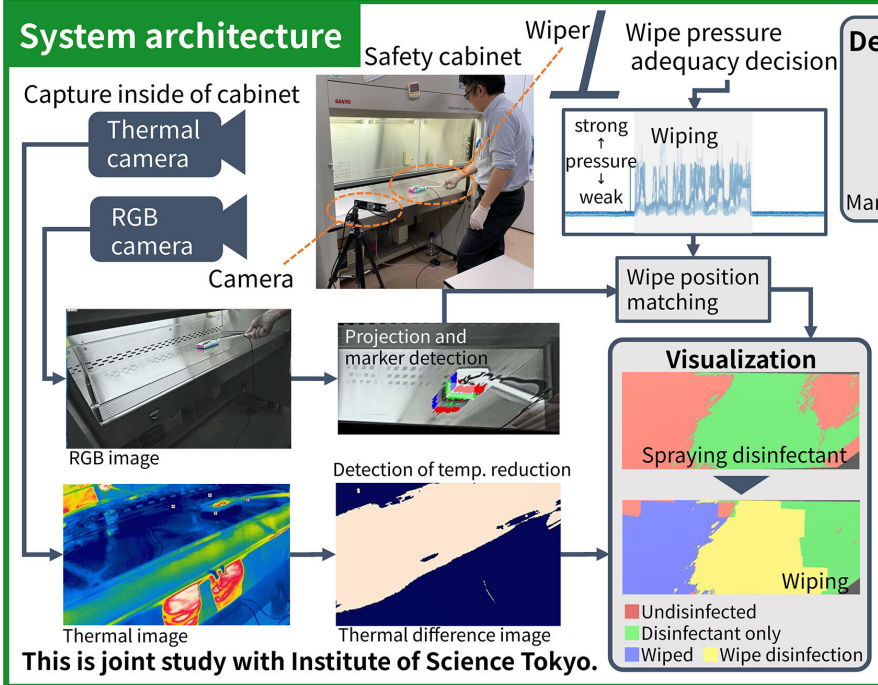
Detection method of disinfected area

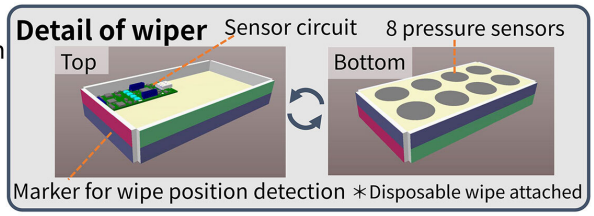
Disinfection: Consistent disinfectant
Detection of temperature reduction area by thermal camera
+ Sufficient wipe disinfection

Wipe: Throughout enough pressure
Install pressure sensor on wiper
Record its position by RGB camera



System architecture

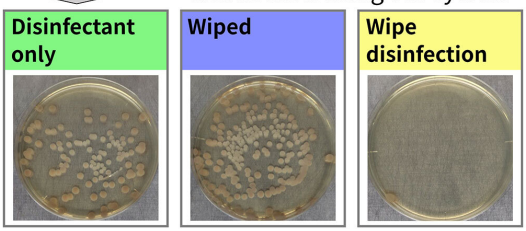




Verification of wipe disinfection

Bacillus subtilis

After applying drops and dry, disinfection using our system



Bacteria was sufficiently decreased only In areas sprayed with disinfectant and wiped. Our system can verify the disinfection area.

This is joint study with Institute of Science Tokyo.

References

[1] Mitsuru Mizuno, Yasue Kishino, Yoshinari Shirai, Junpei Matsuda, and IchiroSekiya, “Assessment of wipe disinfection effectiveness on safety cabinet work surfaces using a wipe disinfection evaluation system” *The 24th Congress of the Japanese Society for Regenerative Medicine*, p.706, 2025. (in japanese)

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