Case study evaluating the use of collaborative robots as support in a microbiological laboratory

Adalbjörg Adalbjörnsdottir[1], Gudmundur F. Hallgrimsson[2], Jeanette Melin[3], Gaetana Sapienza[4], Mohammadali Honarpardaz[4], Christian Smith[2], Aina Iversen[1]
[1]Clinical microbiology, Karolinska University Hospital, [2]KTH Royal Institute of Technology, [3]Metrology, RISE Research Institutes of Sweden, [4]ABB Corporate Research Sweden

Introduction

The focus of this project was to test a new automated solution in a clinical microbiology laboratory by the introduction of a robot, ABB Yumi (IRB14000), to stamp agar plates with antibiotic disks. Automated solutions lead to a reduction in repetitive tasks, increase uniformity in results and increase job satisfaction as it frees up time for the personnel to focus on more meaningful tasks.

Background

A large microbiology laboratory needs to be prepared to handle large amount of samples. At Karolinska in Solna around 325 samples of urine are cultured every day. To speed up turnaround time, all samples are subjected to direct antimicrobial susceptibility testing (AST) in parallel with primary culture. Evidently, stamping hundreds of plates each day is a time-consuming task which requires an automated solution.

Yumi is a collaborative dual-arm robot designed to work with and around human with built-in features to ensure the safety of the personnel (Figure 1). It is also equipped with a vision system allowing it to examine its surroundings, which is made use of in the project.

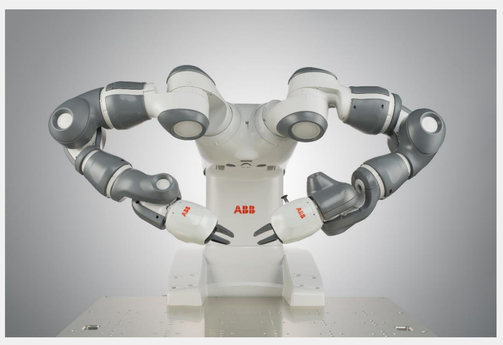

Figure 1: A Yumi Robot

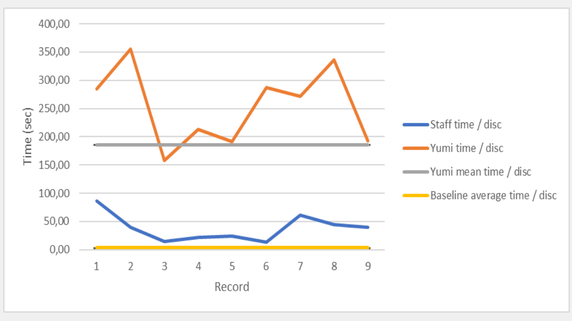

Figure 3: Average time of stamping measured in seconds (y-axis) per each record (x-axis).

Results

<u>Plate stamping:</u> Yumi was able to perform the stamping process according to the goals set up for the project (Figure 2). At this stage of the project it took Yumi significantly longer time to stamp each plate compared to manual stamping made by staff (Figure 3). However, one should notice that the peformance of the robot (e.g. speed) has not been optimized in any form in this project.

<u>Job satisfaction</u>

Six members of staff at the laboratory were interviewed. All respondents were positive towards working with Yumi. Although the initial results did not fulfill their great expectations, they could still see the potential for future improvement. A short summary of pros and cons as stated by the personnel:

Pros: More time to focus on other tasks, reduces risk of strain injury and exposure to contaminants, it looks more cool than other laboratory equipment.

Cons: The robot needs to work faster, an alarm should be added to make it easier to monitor, fears that robots might replace staff with time.

The process

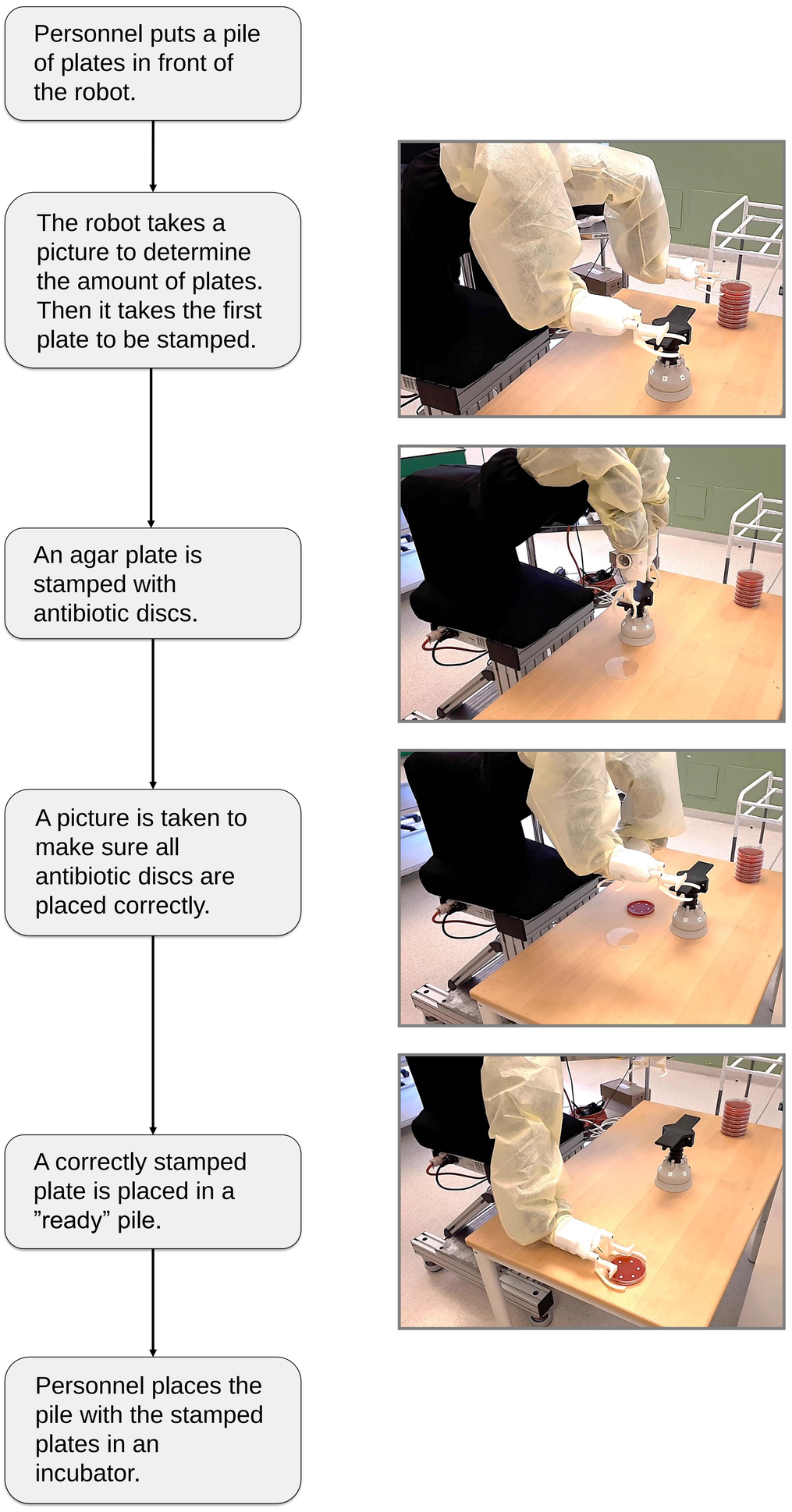

Figure 2: Stamping process performed by Yumi.

Conclusion

Collaborative robots have potential to support work in the microbiology laboratory. Our study has shown that Yumi was capable of performing the task satisfactory and that a collaborative robot can be accepted by laboratory staff. Future improvement will focus on robot performance (e.g. speed) and connection to existing automation solutions.

Karolinska Universitetssjukhuset, Clinical microbiology
Adalbjörg Adalbjörnsdottir
E-mail: adalbjorg.adalbjornsdottir@sll.se
Postadress: : L7:01, Solna 171 76 Stockholm

This project is a part of AutoMed and founded by Swedish Governmental Agency for Innovation Systems