Title

No time to waste: how deep learning can optimize operating room sustainability by reducing the amount of unused instruments

Problem statement

Within hospitals, optimizations in the operating room (OR) and Central Sterile Supply Department (CSSD) could lead to improved efficiency, better working conditions for medical professionals, lower costs and a reduction in CO_2-emissions. Surgical instruments affects both areas, with the potential of optimizing the content of surgical trays. About 40% of the instruments on the surgical table are not used but still have to be sterilized again afterwards, which means a waste of resources. To identify which instruments are not used, the operation tray has to be observed carefully during the operation. Until now, this only could be done by human observers, which is very time consuming, and not done very often. The application of computer vision for the recognition of surgical instruments is a promising technology. It fits within the workflow in the OR, as it does not interfere with the work of the OR personnel and requires no additional tasks, and there is no need to modify the surgical instruments. Limited research has been performed previously on the recognition of surgical instruments using computer vision. The published papers are limited to tests in n a laboratory setting, the challenges that come along with the implementation of image recognition in real conditions have not been considered. An additional challenge will be to couple the utilization of the surgical instrument to the phase of the surgical procedure. This information can be used for the registration of the duration of the procedure, which can be used to optimize future planning of surgical procedures, thereby increasing efficiency of operating room space.

For this project, data already has been acquired in a real OR setting and the challenge will be to develop video analysis techniques to recognize surgical instruments outside the surgical field in the operating room. Given all the advances in the field of artificial intelligence, deep learning is a good candidate to be used to accomplish this task.

Research question(s)

How can the hospital improve operating procedure efficiency and working conditions to Improve sustainability and healthy work environment?

1 - How well can the surgical instruments be recognized from the surgical table?

2 - What Is the Influence of the optimization of the surgical nets on the sustainability?

3 - Can the surgical Instrument recognition be used to monitor the progress of the operation as Input for a more efficient use of the operating room?

Expected type of work

- Testing and improving the current video analysis setup (both python script modifications and hardware setup).
- Interviewing stack holders to Investigate whether unused Instruments really are not needed.
- Calculating the reduction in costs and environmental Impact.

Remarks

Where and when? The project will take place at the Division of Image Processing, Department of Radiology, LUMC, https://lkeb.lumc.nl/, and the Operating room centre. You will be supervised by dr.ir. Anne van der Eijk and dr.ir. Jouke Dijkstra. Start date of the project is flexible, duration is 6 – 12 months

References

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