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This document summarizes and presents the topics for the Medical Robotics course for the Master's degree in Artificial Intelligence and Robotics at Sapienza University of Rome. The document is free for any use. If the reader notices any typos, they are kindly requested to report them to the author.
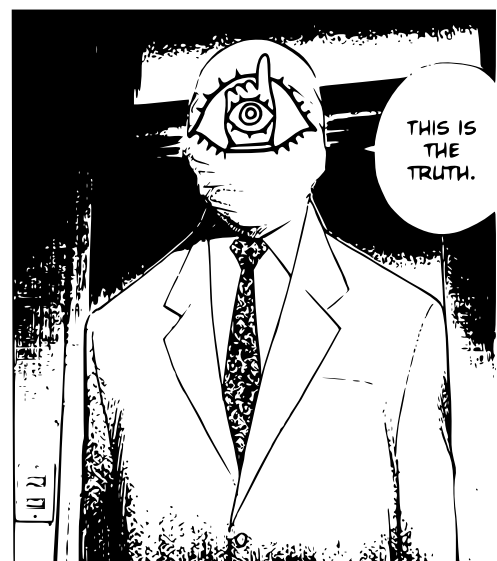
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CHAPTER

1

INTRODUCTION

Robotics have entered the domain of healthcare in the last three decades, nowadays we have tools for clinicians and surgeons, robots and mechatronic tools for therapy and training. We distinguish mechatronic tools from the robots, the latter includes some "autonomous behavior". The field of medical robotics have evolved to deals with different types of materials, from rigid to soft (usually harder to model), and to operate from the macro to the micro size. Some kinds of surgical operation requires an open access to the body, others ar *minimally invasive*, a classic configuration is the following
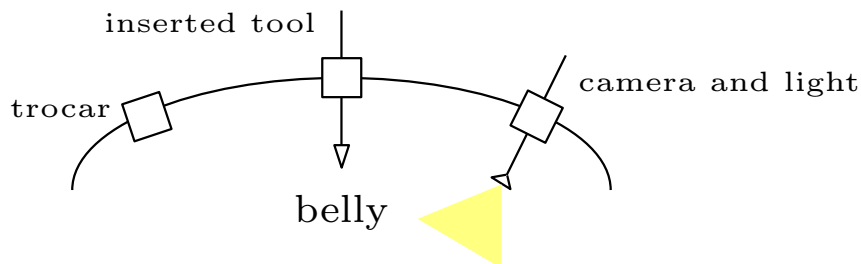
where the *trocar* are cylinder-shaped devices used to create small holes in the body to let the surgical tools held by the robots enter (usually equipped with lights and cameras).

Usually, medical robots require an high cost of installation and maintenance, and an increased size of cognitive load for surgeons and staff to operates with these devices, situation awareness is critical. Medical devices also have to pass through a long process of certification.

Differently from the industrial domain, the medical robotics have to take in account one additional variable, the *human being*, that has to be considered in the control loop, both the patient and the surgeon that tele operates the robot.