Curiosity Made the Robot

Whether it has led us to mars or killed the cat, one persistent theme in humanity is curiosity. A seemingly innate desire to discover and understand everything around us. Naturally though, this driving need to find answers is not without flaws. Almost equal to our driving curiosity, is our need for perfection. Not only must we find all the answers, we must find the perfect answer, and to do so, we must embody perfection. This is our obstacle. We know our mind's limits, and those limits have been reached, at least in this task. So we must use stand-ins and substitutes: we must use machines. While we ourselves can never attain perfection, we can use computers and robots to bridge the gap between our abilities and our goals. This approach is applied to everything, from analyzing information to performing complex tasks. In the case of Dr. Juan Wachs, a professor of industrial engineering at Purdue University, his research is applying these concepts to the world of healthcare.

Perhaps more than anyone, doctors are expected to maintain a level of perfection far beyond any other profession. In reality though, the medical field is plagued with human error, and in particular, miscommunication. Doctor Wachs' research is in interpreting incoming information from the patient, charts, and colleagues, and turning that into efficient and precise responses in the operating room. There is two ways he is seeking to accomplish this, one, by reducing human error in the operating room, and two, by improving communication and learning within the operating room.

Designed by Dr. Wachs and his collogues to complement, but not replace, Baxter is a friendly-looking, duel-armed robot trained to respond to both gestures and verbal commands in the operating room. His previous iteration was an industrial robot, but testing found it to be incompatible with the delicacy needed in an operating room. Baxter himself is not quite at the

level researchers are hoping for, but still steadily getting them closer. While removing human error is the goal, the current robots being introduced into medical settings are still susceptible to systematic error, and as such, are not yet a viable replacement for a surgical technician. The biggest obstacle for robots like Baxter to overcome is the ability to predict what the surgeon needs ahead of time. While a nurse may misinterpret a surgeon when he asks for an instrument, losing precious time, she is also capable of sometimes anticipating what he needs before he asks for it. With this in mind, the future of these robots in the operating room rests on scientists' ability to merge the precision of machines with the intuition of human beings. While the feasibility and effectiveness of Baxter and robots like him remains to be seen, this is not the only way machines can be used in medicine.

Telomentoring is one of the most useful applications of machines in the operating room. In the past, attempting to transfer information from one surgeon to another could only be accomplished verbally. Now, through a variety of methods, expertise can be delivered across long distances in a multitude of communication forms. Through experimentation with multiple devices, Dr. Wachs and other scientists have prototyped a virtual patient that skilled doctors can interact with, teaching less experienced surgeons how to perform complex operations. The skilled surgeon can not only verbally guide the other doctor through the process, but also show them exactly where incisions need to be made and what instruments to use. This is done via a projection of the doctor's virtual surgery over the actual patient. Not only does this have useful applications in teaching student doctors, it can also be applied to situations where a doctor is present, but in too remote of a location to physically bring in an expert. While in theory, this sounds like a successful use of technology, a working reality is far more difficult to create.

Have we found the perfect solution to these problems in medicine, the perfect answer for how to communicate in the operating room in a way that enhances learning and reduces error? Machines are wonderful tools for doing things human beings cannot, but they are poor replacements for what we can already accomplish. Introducing a robot into the operating room might mean that it can deliver tools faster than any human, but it cannot reason in the same way as an actual surgical technician. In the case of telomentoring, technology proves its usefulness, but in a situation where it is better than nothing, and a poor substitute for a living, breathing doctor guiding you through the process. Of course, just because the current technology has not reached perfection does not mean it is not on the right path.

Doctor Wachs and his team are leading the charge into a new frontier in medicine. They are asking new questions and finding new solutions, and while perfection may not be entirely captured, they are undoubtedly embodying the curiosity that makes humanity what it is. What role their technology plays in the future has yet to be seen, but no matter what may trip them up along the way, the results are bound to be interesting.