The future of Medicine in a Robotic World

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Hand-eye calibration: From uni-robot to multi-robot

Ream the acetabulum until the center of rotation depth values read 0mm. Please refer to the applicable surgical technique for the recommended final reamer size.
Where are we today?

• Machine learning
• Block chain
• Big data
• Deep neural networks
• SLAM
• Cloud robotics
• Robobiology
• AI
Why Now?
It’s time for robots

Advances in sensors, actuators, computation and machine-to-machine communication mean robots can achieve their potential.

“One of the top 10 disruptive technologies in the next 10 years”
- McKinsey
Moore’s Law
Ray Kurzweil
Cloud Robotics- Kuffner 2010
Deep Learning Algorithms
(Neural Networks)
Big Data
Digital Health

• A key focus will be on developing digital health technology businesses. The market is growing internationally at over 26% annually and reaching $400B p.a. by 2024. We will work with partners and external organisations that specialise in growing and supporting startups and securing investment capital.
NATIONAL JOINT REPLACEMENT REGISTRY

Hip, Knee & Shoulder Arthroplasty

ANNUAL REPORT 2017
Cognitive Insight #1

Health

See how IBM Watson can read 40 million articles in 15 seconds to help conquer cancer →
Algorithms
Machine Learning
Smartphone bytes back.

Bites from malaria mosquitoes claim more than half a million lives every year. But the smartphone is emerging as a new weapon in the fight against this killer.

As part of the Australian Centre for Robotic Vision, researchers at QUT are playing a pivotal role in developing a low-cost microscope that attaches to a smartphone, making on-the-spot diagnosis of malaria possible.

Using state-of-the-art computer vision and machine learning techniques, a stained blood sample is compared with a database of images to identify the presence of the malaria parasite. The system eliminates the need to send samples to a lab, so treatment can begin immediately if required. It requires minimal training, no internet connection, and kits can be quickly shipped to regions suffering outbreaks.

The ACRV team is optimistic it will be used to help diagnose many diseases as well as malaria which is more than smart, it’s lifesaving.

Find out more at www.qut.edu.au
Companion Robots
Assisting Robots
Aim 1: Detector/descriptor assessment

- Experiment 1:
  - Detectors: SIFT, SURF, FAST, MSER, CenSurE (STAR).
  - Measures: keypoints quantity and variability, computation time, spread.
  - Dataset A1/A2.
Validation test stand
GUIDED KNEE ARTHROSCOPY

2 VISUALIZE
- 4D image guidance

3 INTERPRET
- Deep learning-based tissue recognition

- CLINICAL TISSUE RECOGNITION
- 3D model of the knee joint

- AUTOMATED IMAGE REGISTRATION
- Improved accuracy and precision

- BETTER PRECISION AND SAFETY
- Surgical errors and complications reduced

- AUTOMATIC TISSUE RECOGNITION
- Enhanced surgical outcomes
Augmenting Robots
Exoskeletons

- Columbia University engineering researchers have designed a robotic spine exoskeleton (RoSE) to treat spine deformities. The researchers claim that it is the first device to measure and modulate the position or forces in all 6 degrees of freedom in specific regions of the torso. The brace consists of rings on the pelvic, mid thoracic and upper thoracic regions of the spine with the motion of 2 adjacent rings governed by a parallel-actuated robot.

- *Columbia University first dynamic spine brace, 09/04/18*
Memory Augmentation

• Researchers at the University of California Viterbi School of Engineering claim to have identified a way to write a code to a patient’s memory that will improve existing memory through an implant with claims that epilepsy patient’s short-term memory improved 35-37% over baseline measurements.

• Kurzweil accelerating intelligence News, 03/04/18
Conclusions

• We are about to be disrupted as a profession
• Robotics, automation, machine learning and big data is here to stay
• Hospitals and doctors that don’t react will be left behind