Vander Poorten: Device and method for force measurement in simulated minimal invasive surgery

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Technology description

Summary
A training device for minimally invasive surgery with built-in force sensing.
The demand for 'minimally invasive', 'laparoscopic' or 'key-hole' surgery techniques has increased in recent years driven by factors such as increasing healthcare costs, rising focus on patient safety and the availability of new technologies. Whilst the demand has increased, the adoption of these types of techniques by healthcare professionals has been inhibited by many factors, one major factor being the lack of options for training for what are complex procedures.
Training on patients, cadavers or animal models are increasingly non-viable options for various reasons, which has led to alternative training methods emerging in recent years. Laparoscopic surgery simulators range from simple inexpensive manual training boxes (~£100) to expensive virtual reality (VR) systems that may or may not incorporate haptic feedback mechanisms, that can cost from ten to hundreds of thousands of pounds.
The existing systems have pros and cons associated with them. For example, the box trainer includes physical training objects below the surface. As the interaction with these objects is physical it is highly realistic. However, it does not provide automatic collection of data to assess the user performance and provide guidance to improve their technique over time. The VR systems have a screen depicting VR models that help to train hand-eye co-ordination of the user and can record information for training purposes, but the surgical hand tools do not 'feel realistic'.
Market Opportunity
The global medical simulation market was valued at almost US$900m in 2014 and is forecast to reach over US$2.27bn by 2021, with an approximate CAGR of 15.2% from 2016 to 2021. North America accounts for approximately 50% of the global market, followed by Europe and Asia-Pacific. However, the biggest growth markets are expected to be Asia-Pacific and Latin America.

Advantages

• Use of existing surgical tools that allow realistic incision and manipulation actions;
• Any type of tissue-mimicking sheet (real or artificial) can be used to simulate the body wall through which the surgery is performed;

• A sensor system that can assess the forces and torques exerted by the surgical tool on the tissue-mimicking sheet;
• Ability to collect data on forces and torques exerted by the user to enable surgical skill evaluation and training;
• Force and torque data can be fed into a VR system through a digital interface thereby allowing mixed reality training systems.

Institution

UCL Business