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INTRODUCTION
Medical image analysis (MIA) researchers at Oxford are working with clinicians at John Radcliffe and Churchill Hospitals on analysis of colorectal and liver cancer images. Some of the problems these multidisciplinary teams have to deal with during their research work include the generation of ground truth and visual input data.

MANUAL SEGMENTATION
• Medical images are often highly textured and sometimes boundaries may appear blurred making difficult their segmentation.
• Ground truth is the term MIA researchers use to denote target shapes which are manually segmented by either expert clinicians or MIA researchers.
• This process could be both tedious and time consuming since it is carried out in 3D large data sets (~30 slices).

MULTIDISCIPLINARY TEAM MEETINGS
In multidisciplinary team (MDT) meetings, relevant information for each case of colorectal and liver cancer is presented to an audience of radiologists, pathologists, oncologists, surgeons and specialized nurses. A set up of an MDT meeting is illustrated in Figure 3.

The analysis of the evidence, including the results of image analysis, is made. Images are displayed on a vertical wall, and the radiologist in charge is the only person able to manipulate them (move, zoom in/out, etc). Followed by a discussion a decision is made and registered.

Using a tabletop will allow collaborative input.

INITIAL DEVELOPMENTS
We started our developments in C#, however, our user interface and displays services were limited. We then moved onto Windows Presentation Foundation (WPF) which render display services more efficiently.

Our development framework lies on the .NET framework making it possible to merge unrelated programs and classes within a unified model including imaging tools such as ITK.

CONCLUSIONS AND FUTURE WORK
Researchers and clinicians have been introduced to DiamondTouch. Partial image occlusion (due to the top projection) and touch resolution (due to the clumsiness of fingers) showed no initial drawbacks. A more detailed assessment is contemplated in our future work.

In MIA scenario, image quality and resolution may limit the use of this technology. There are standards in terms of luminance and image contrast that display devices must comply with in order to be considered for the analysis of medical images.

We envisage a combined set-up of vertical and horizontal displays in MDT meetings, as illustrated in Figure 4.

A horizontal and interactive device for active members who are making decisions, whose inputs can be collected and audited to show who performed specific annotations. Vertical displays for passive members attending to such discussions.

We will assess the feasibility of such set up.

Graphical tablet technology may assist with making the annotations performed by the surgeons. The segmentation and the toolkits are not currently unified.

The mouse pointer and the tip of the pen occasionally occluded the shape they wanted to outline.

The screen had to be calibrated every time the tablet was held in a different position.

DiamondTouch is a multi-user multi-touch tabletop that has arrays of antennas on the top of the surface (for our DT107 model, 172x129) with weighted interpolation that increases touch resolution by a factor of 16. Up to 4 unique signals generated by small AC electrical currents (~ 300 µamp) are transmitted by users seating or standing on the top of receiver pads.

DiamondTouch tabletop at the OeRC.

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Figure 1. Example of mesorectal fascia segmentation in MRI colorectal cancer images using: (a) a non-parametric mixture model (NPMM) level sets approach developed by Dr. Niranjan Joshi (cyan); (b) the expert’s delineation or ground truth shape (yellow).

Figure 2. Graphics tablet.

Figure 4. Proposed configuration for MDT meetings using multi-touch surfaces.