MicroTips: Augmenting Information for Microscopic Inspection

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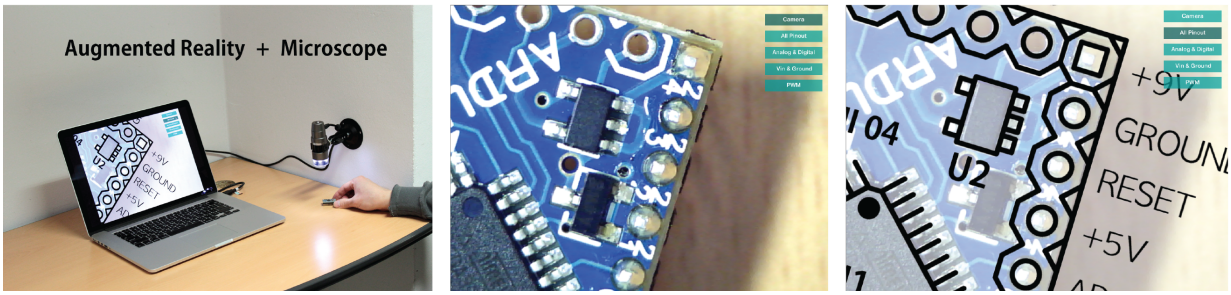

Figure 1 (Left) An Overview of MicroTips. (Center) Original video fed from the microscope. (Right) Augmented information overlaid on top the original video.

1. Introduction

In the micro-scale world, it is difficult to add sufficient information to users due to the restriction of size in micro manufacture processes. Unlike macroscopic objects in the scale of the human's eye, simply printing some texts to micro-scale objects requires much effort (Hanson and others, 2011), resulting in significant increase of production costs. This aspect of the micro-scale objects may reduce the quality of user experience for those who inspect artificial micro-scale objects with microscopes.

Authors were previously investigated the possibilities of the augmented reality in the microscopic area (Yun and others, 2013). In this study, we broaden the concept of the microscopic augmented reality and demonstrate image-based augmented reality applications for the inspection of microscopic components. Using MicroTips, users can be provided with augmented information as virtual images overlaid on top of the original video fed from the microscope. Supported by this augmented reality aids, such as virtual assembly guides, electric connections or specification of micro-components, the inspection of the microscopic world could be enriched.

2. System Overview

The prototype of MicroTips system combines a microscope, and the image-based augmented reality framework. Continuously comparing reference images with the current video fed from the microscope, the system provides augmented information of the microscopic objects. To prove the concept of this microscopic augmented reality, an embedded micro-controller unit board had been inspected as an example.

3. Applications

3.1. Augmenting Information

Just focusing on the target specimen, users can be provided with dynamic augmented information that is too complicated to be printed on micro-scale objects. In our prototype, specification of the component was overlaid on top of the specimen such as the detailed information of pin-out configurations of microchips.

3.2. Interaction

In MicroTips, a basic-level of virtual interaction with micro-scale objects could be achieved. For example, when a user hovers the cursor of a mouse over a certain point of interest in a specimen, tooltips pop up correspondingly. The interaction is effective to integrated circuit boards where components are densely integrated in a compact area, and there is generally not enough space to contain user-friendly information. With augmented reality techniques, it may become easier to contain rich information over the compact and complex region of micro-scale objects.

3.3. Simulating an Experiment

MicroTips suggests a convenient method for providing manuals for microchips. Through our technology, we can augment useful information for bio-medical micro-devices such as the Lab-on-a-Chips. For example, MicroTips can augment virtual experiment animations, showing the detailed sequence of the usage of the microchips. In the prototype of our system, the MicroTips provided virtual usage of an integrated circuit board. We are conducting ongoing researches to enrich the user experience of bio-medical micro-devices.

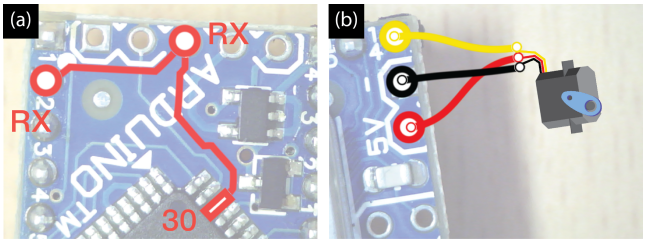

Figure 2 (a) Interaction with the interest. (b) Simulation of the experiment.

4. Conclusions

In this study, we applied an AR technique to micro-scale objects. Through simple visual guide augmentation while interacting with micro-scale objects, we could enrich the information usually considered difficult to be physically imprinted on micro-scale objects. We believe that this AR technique could greatly enhance the daily routines of microscopic inspections.

References

Hanson L, Cui L, Xie C, Cui B. 2011. A microfluidic positioning chamber for long term live cell imaging. Microscopy Research and Technique 74(6):496-501.

Yun K, Chung J, Park Y, Lee B, Lee WG, Bang H. 2013. Microscopic augmented-reality indicators for long-term live cell time-lapsed imaging. Analyst.