

## Mobile Camera Based Calculator

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Use Android Phone?	Yes

### Description

This project is inspired by the iPhone app "Youdao". It identifies the text captured by the camera on a mobile device, translate to another language, and return the result back onto the screen. The motivation of this project is to enable user to take a picture of an equation using the Android phone. Then the application will return the calculation result. Operators in the equation can be: + - \* / ^2 sqrt sin cos tan cot log, etc. This enables the user to do a fast calculation on mobile service.

### Goal

The first milestone is to accurately recognize the printed equations and calculate the result. Hopefully, the application can identify handwritten equations. We first assume that we have monochromatic background and enough illumination.

### Design Methodology:

- (a) Perform YCbCr to RGB to gray conversion
- (b) Binarize the gray-scaled image
- (c) Identify each character: Identify tokens of the equation which are not connected characters. For each token, find the corresponding data in the database (including numbers, alphabets, and operators).
- (d) Combine each identified character into legal equation
- (e) Send to local calculator application or web-based application
- (f) Send calculation result back to mobile device
- (g) Display result in a user-friendly manner

### Reference:

- [1] Huiping Li, David Doermann, Omid Kia, *Automatic Text Detection and Tracking in Digital Video*, IEEE Transaction on Image Processing Vol. 9 No. 1, Jan 2000
- [2] Yassin M. Y. Hasan and Lina J. Karam, *Morphological Text Extraction from Images*, IEEE Transaction on Image Processing Vol. 9 No. 11, Nov 2000
- [3] Handwritten Number Recognition by Yan Cheng, Cheok Numrecognition.sourceforge.net (2007)*Handwritten Number Recognition by Yan Cheng, Cheok*. [online] Available at: <http://numrecognition.sourceforge.net/numrecognition/index.html> [Accessed: 1 May 2012]