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EE 368 Final Project Proposal

### **Competitive Analysis of Printed Circuit Boards**

Competitive analysis is a crucial task in the hardware electronics industry that drives both product pricing and functionality. Specifically, a list of the components on a printed circuit board (PCB), or a Bill of Materials (BoM), can be used to directly obtain a good cost estimate of the product. Compiling a BoM by means of manual analysis can be tedious, time consuming, and prone to human error. Instead, modern image processing techniques can be used to expediently produce a BoM and a backend database can be leveraged to translate the BoM into a PCB cost estimate.

To produce the bill of materials, we propose to use a maximum a posteriori probability (MAP) detector to identify integrated circuits (ICs) and passive components (resistors, inductors, capacitors). Once the location of these components has been identified, we will perform thresholding to segment the image into three parts: ICs, passive components, and background (not of interest).

For each IC, we will correct for orientation and perform another thresholding step to bring letters into the foreground. A cross-correlation step is then used to identify the letters on the IC that can finally be used to index into a database to retrieve model and pricing information.

Because passive components on a dense PCB are almost always surface-mount devices with the same geometries and no labeling, discerning between resistor, inductors, and capacitors is practically infeasible. Instead, we will aim to merely identify each passive component (again using a MAP detector, thresholding, and region counting) and make some crude assumptions about the component costs of passive surface-mount devices. Since the cost of surface mount resistors, capacitors, and inductors are usually within a few cents of each other, this approach should still yield fairly accurate estimates in many cases. Another metric of great interest in a competitive analysis is the size, or number of components, on a BoM - our approach still allows this invaluable information to be captured.

Note: We will not be using a DROID camera phone.

### **References**

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