UPC Barcode Scanner
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1. What is a UPC Barcode?

A Universal Product Code (UPC) is placed onto almost every single item that you purchase. When purchasing an item, its UPC is scanned, and will print out a product name and its price. The other option of pricing items would be to manually type in its price. Typically, the UPC is scanned by a laser, but our application will take a digital picture of a barcode to analyze.

2. How it Works

Each UPC consists of a white rectangle with printed black bars of varying sizes. These different sized bars are then turned into a 12 digit code. When purchasing an item, a computer will match the 12 digit code to a product. Thus, it can display store created information such as its name, price, and savings.

3. Decoding Bars

Each number that is encoded into a UPC is represented by 4 bars. Again, each bar contains varying sized bars.

0 = 3-2-1-1
1 = 2-2-2-1
2 = 2-1-2-2
3 = 1-4-1-1
4 = 1-1-3-2
5 = 1-2-3-1
6 = 1-1-1-4
7 = 1-3-1-2
8 = 1-2-1-3
9 = 3-1-1-2

Table 1. 9-digits are represented by 4 varying sized bars.

There are 4 parts of a barcode: Header, Data, Middle Consistency, Data, Stop.

Header
3-bars
The header is the start of the barcode. It is found by scanning left to right, finding the first occurrence of a black pixel. The header will be 1 black, 1 white, and 1 black bar. These bars set the standard of what the size of a bar representing a 1 is. Since our image could be zoomed in or out, the standard bar size could vary.

Data (1)
6-digits, 4 bars each, 24 bars
These are the first 6 digits of our UPC code. Each digit will be 2 black bars and 2 white bars (B-W-B-W or W-B-W-B). Once you have read in 4 bars, you can look up those 4 bar sizes in Table 1. Thus, you have scanned 1 digit of the UPC code.

Middle Consistency
5-bars
The purpose of this is to make sure that you have scanned your UPC code correctly so far. This will contain 5 bars of standard size.

Data (2)
6-digits, 4 bars each, 24 bars
These are the last 6 digits of our UPC code.

Stop
3-bars
This is the end of the UPC. It is marked the same as the header. The 3 bars should again be of standard size.

4. Conclusion

This is a fairly simple application to program. When dealing with UPC barcodes taken from a picture, it is best to zoom in very close to them. I found that only UPC barcodes taking up less than ½ a page were too low in resolution to use.

5. References

[1] How UPC Bar Codes Work
http://www.howstuffworks.com/upc.htm

[2] Barcode Generator
http://www.terryburton.co.uk/barcodewriter/generator/