Mouse Sensor
with Barcode Application

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Preface (The Barcode Brief Introduction)

**International Code**
- **EAN-13**
  - 123456789012
- **EAN-14**
  - 1 471 123456 789 6
- **EAN-8**
  - 12345670
- **UPC-A**
  - 123456789012
- **UPC-E**
  - 012345675

**Private Code**
- **Code 39**
  - 123
- **Code 93**
  - 123
- **Code 128**
  - 123

**EAN-13**

Initial and Ending Symbol:
Black (1W) + White (1W) + Black (1W)
Basic Principle for Application

• For dot sensor:

• For line sensor:
The Limitation of the Mice Sensor

1. It only can work on the flat surface.

2. The sensor image dump rate v.s the motion speed must be care.

3. User must stabilize the motion tracking and speed.
Dot or Line ? Which is better ?

- Comparison Table

<table>
<thead>
<tr>
<th>Barcode Reader Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dot sensor (2x2)</td>
</tr>
<tr>
<td>Line sensor (1x16)</td>
</tr>
<tr>
<td>Very Easy</td>
</tr>
<tr>
<td>Lots of Array data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>image dump frequency</th>
<th>pixel frequency</th>
<th>ideal maximum speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dot sensor (2x2)</td>
<td>1690 loops/sec</td>
<td>3380 pixels/sec</td>
</tr>
<tr>
<td>Line sensor (1x16)</td>
<td>533 loops/sec</td>
<td>8528 pixels/sec</td>
</tr>
<tr>
<td></td>
<td>7.98 inches/sec</td>
<td>20.14 inches/sec</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>barcode block width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dot sensor (2x2)</td>
</tr>
<tr>
<td>Line sensor (1x16)</td>
</tr>
<tr>
<td>cannot recognize</td>
</tr>
<tr>
<td>can recognize</td>
</tr>
<tr>
<td>(2 pixels = 0.12mm)</td>
</tr>
<tr>
<td>the minimum width</td>
</tr>
<tr>
<td>(0.33mm * (0.8~2.0) = 4.4 ~ 11 pixels)</td>
</tr>
</tbody>
</table>
Barcode Reader Work Flow of the Line Sensor

Start

Sweep the Mouse and Scan the Barcode Picture

Get the Image Data when Sensor in the Image Dump Mode

Transfer the Image Data to B/W Image Data

Image Array Data Calculation

Get Barcode Block Array and Motion Delta Array

Follow the EAN-13 Spec.

Y

Block Array Data to Barcode Number System

Show Barcode Number and Barcode Image

END

N

Clear Image Data and Show Error
Why to Get Wrong Barcode Data?

1. The motion tracking or the speed is unstable.

Ex: 4712907000248

2. It is easy to loss block data if the motion speed is too high.

3. The unit block of the barcode is too width.
   - Ref. the barcode EAN-13 spec., the width of an unit block is $0.33\text{mm} \times (0.8\sim2.0)$.
     - i.e. $4.4\sim11$ pixels length

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Summary:

It’s really difficult to get a perfect barcode image via a normal optical mouse sensor. That’s also a focus issue for all barcode reader.
## Barcode Reader Comparison

<table>
<thead>
<tr>
<th>Type</th>
<th>Features</th>
<th>Remark</th>
</tr>
</thead>
</table>
| Handy Type   | 1. back and forth scan (2 lines)  
2. scan rate : 100 Hz  
3. cost effective | barcode reader     |
| Fixed Type   | 1. omnidirectional scan (20 lines)  
2. scan rate : 1500 Hz  
3. high performance | barcode reader     |
| Sweep Type   | 1. forth (or back and forth) scan (1 line)  
2. scan rate : 2 ~ 4 sec  
3. low cost     | more function combination |