Automatic Platelets Counter For Supporting Dengue Case Detection In Primary Health Care In Indonesia

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Dengue

- The world’s most common mosquito-borne viral disease
- The fastest emerging arboviral infection
- Major problem in Indonesia
- More frequent outbreaks
- No dengue vaccine yet
- Can be life-threatening
17633 islands
238 Million population
33 provinces, 530 districts
~1700 hospitals
~9000 primary health centers
Platelets in dengue infection

- Dengue may alter the platelets and which leads to thrombocytopenia
- Thrombocytopenia is a relative decrease of platelets in blood
- In primary health centers, platelet counting is usually performed manually which is labor intensive and requires an experienced laboratory technician
Methods

Action research
• Application development

Image processing
• Otsu algorithm

Evaluation
• Inter-rater agreement (laboratory expert – computer-based)
5 Megapixel web camera
Process of platelets detection

A. original image
B. original image converted to grayscale
C. inverted grayscale image
D. grouping of sizes and morphologies
E. application of the Otsu algorithm
F. platelets in binary format
Results

- 11 of the 19 samples (59% of the cases), the agreement of the two methods is 100%
- Remaining samples the difference in counts was 1-2 platelets

<table>
<thead>
<tr>
<th>Images</th>
<th>Manual</th>
<th>Computer based</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 1</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Sample 2</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Sample 3</td>
<td>5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Sample 4</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Sample 5</td>
<td>3</td>
<td>3</td>
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</tr>
<tr>
<td>Sample 6</td>
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<td>0</td>
</tr>
<tr>
<td>Sample 7</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sample 8</td>
<td>2</td>
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<td>0</td>
</tr>
<tr>
<td>Sample 9</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

- No significant difference (p=0.48) between manual versus computer-based calculation
- Kappa coefficient = 0.6
Lesson learned

• The system has been developed using minimal resources and applied to resource-poor settings
• While blood sample cannot be kept after examination, the images derived from this system can be stored together with patient information
• Challenge in technological infrastructure (computer, electricity)
Conclusion

• Automatic platelet counter for low resource setting to support dengue case management

• The system shows great promise with moderate agreement compared to the manual method

• Large scale evaluation with blood samples from various conditions would be valuable to improve the accuracy
Thank you

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