AN ALGORITHM TO COUNT A PASSING OBJECT BASED ON VIDEO SIGNAL PROCESSING

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Abstract

We propose an algorithm in ideal case to count a passing object based on video signal processing. The procedure is very simple. The object is tracked whether it has already passed the marker (a virtual line) and made the recording of leftborder (edge of object that will firstly cross the marker) position change. If the object has passed the marker, then it is calculated when the leftborder's position is increased. The analysis result is also presented to support the validity of the algorithm.

1. Introduction

Some research in counting an object using video processing has been evolved. In [5], is designed a PCB counting system on moving conveyor using local horizontal distinguishing level. An automatic visitor counting using two virtual lines is presented in [6]. The counter increases when the

blobs cross the specific virtual line, and decreases when it crosses the other virtual line. In real-time people counting [7], it just used a virtual line and the counter increases when centroid of an object crosses the line. Research in [8] also presented real-time people counting but it used a fixed virtual region in the middle of the detection range of the camera that was selected for the counting. Another method is explained in [9], wherein an object is first checked to see whether it is already registered in the buffer, if the object is not registered, then it must be a new object and the counter increases.

Initially this work is a continuation of research [1] in reporting the amount of wood that has been successfully segmented. But in its development, we construct a model in general that can be used in all cases to calculate the passing object based on video signal processing. It is important for knowing the availability of land or making documentation. So we propose a model in ideal case and only focus to the algorithm. Especially the contribution is to make more clear existing method in [7] where it did not explain in detail how the object is to be counted. Our proposed algorithm also used a virtual line called *marker* as a tool in counting the passing object.

2. Research Method
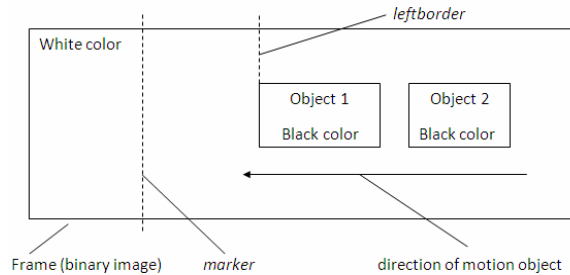
Figure 1 below explains the model.

Figure 1. The model.

This model uses the following rule:

• Objects move from right to left.

• The object never moves backward, but no movement is still allowed.

• All the objects move on the same track.

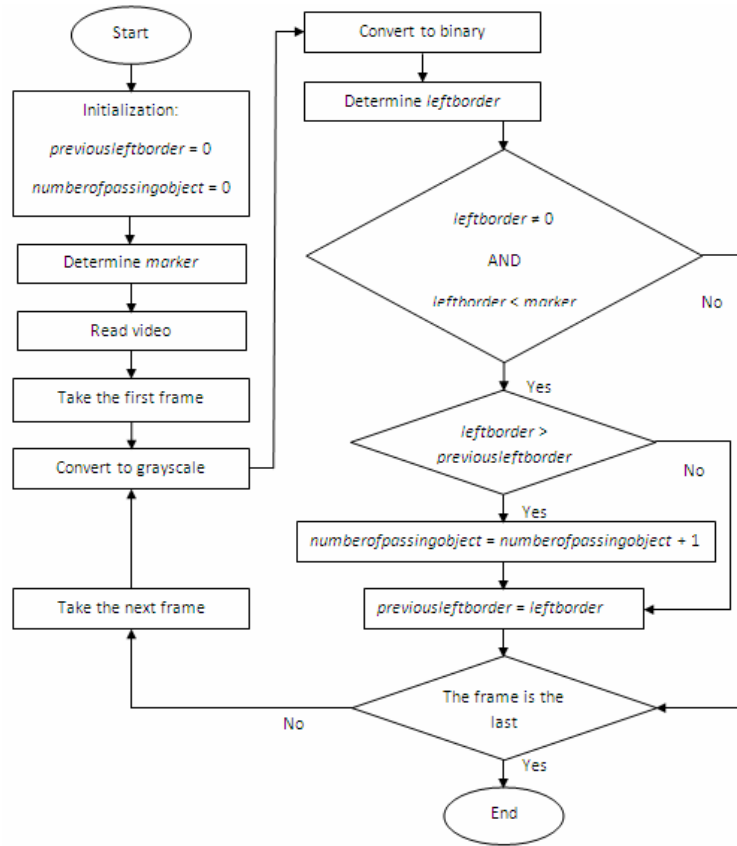Figure 2 below is flowchart of the proposed algorithm.

Figure 2. Flowchart of the proposed algorithm.
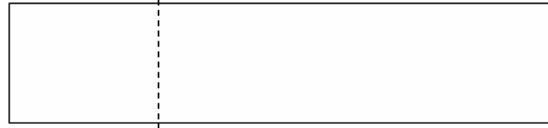
Terms used are explained as follows:

• *Previousleftborder*, a 1-dimensional matrix for tracking the movement of *leftborder* position after passing the *marker*.

• *Numberofpassingobject*, a variable to count the passing object.

• *Marker*, a column position on the frame which is used as a boundary to determine whether the object has passed or not.

• *Leftborder*, a column position on the frame that represents the front end of the nearest object that will pass the *marker*. *Leftborder* will be zero if there is no object that passed the *marker*.

3. Results and Analysis

Figure 3 below describes the tracking of each frame.

For example, frame resolution is 60 x 240, then *marker* = 60
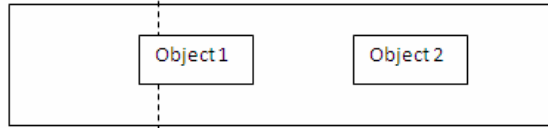
1ˢᵗ frame, there has not been a passing object

leftborder = 0
numberofpassingobject = 0
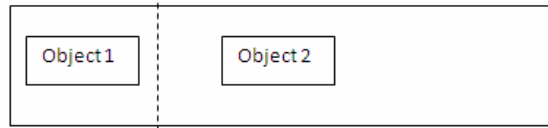*previousleftborder* = 0

2ⁿᵈ frame, object 1 comes

Object 1

leftborder = 150
numberofpassingobject = 0
previousleftborder = 0

3ʳᵈ frame, *leftborder* ≠ 0, *leftborder* < *marker*, and *leftborder* > *previousleftborder*

Object 1   Object 2

leftborder = 50
numberofpassingobject = 1
previousleftborder = 50

4ᵗʰ frame, *numberofpassingobject* didn't increase because *leftborder* < *previousleftborder*

Object 1   Object 2

leftborder = 10
numberofpassingobject = 1
previousleftborder = 10

5ᵗʰ frame, *leftborder* ≠ 0, *leftborder* < *marker*, and *leftborder* > *previousleftborder*

Object 2

leftborder = 40
numberofpassingobject = 2
previousleftborder = 40

6ᵗʰ frame, the object has passed

leftborder = 0
numberofpassingobject = 2
previousleftborder = 0

Figure 3. The tracking of each frame.

Table 1 below describes the results of tracking on *previousleftborder*.

Table 1. The results of tracking on *previousleftborder*

Frame	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Previousleftborder	0	0	0	52	29	29	29	41	16	16

Frame	11th	12th	13th	14th	15th	16th	17th	18th	…	End of frame
Previousleftborder	16	0	0	49	24	5	0	0	…	0

• On 1st frame until 3rd frame, no object that passed the marker.

• On 4th frame, there is object 1 that passed the marker.

• On 5th frame until 7th frame, object 1 stops (has no movement).

• On 8th frame, there is object 2 that passed the marker.

• On 9th frame until 11th frame, object 2 stops (has no movement).

• On 12th frame until 13th frame, no object that passed the marker.

• On 14th frame, there is object 3 that passed the marker.

• On 15th frame until 16th frame, object 3 is kept moving and does not stop.

• On 17th frame until the end of the frame, no object passed the marker.

• So in total there are 3 passing objects.

4. Conclusion

Leftborder position change is a feature that is very important to determine when the object will be calculated. *Leftborder* is compared with *previousleftborder*, and the object is calculated when the position of *leftborder* is increased or when the *leftborder* value is greater than that of the *previousleftborder*. With the validity of the process which has been done, this algorithm can be used in all cases to count the passing object based on a video signal processing.

Acknowledgement

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