heatmap construction using background subtraction

Nicolas A. Maduro
Laboratory for Interdisciplinary Research on Multimedia Information
CEFET-MG
Belo Horizonte, Brazil

Thales B. Nascimento
CEFET-MG
Belo Horizonte, Brazil

Fig. 1. Teasing result of our method: from this data input (left), the relevant feature are extracted using our technique (middle), producing effective result (right).

***Abstract*—**

***Keywords*-Heatmap; Background subtraction;**

I. Introduction

Contributions:

A. Related work

(a) First step (b) Second step (c) Result

Fig. 2. Technique overview

B. Technique overview

In order to produce this application, we start with this processing, followed by this technique. In order to cope with this challenge, we introduce this formulation to produce this intermediate result. The formulation leads to this type of system, which is efficiently solved by adapting this technique. The final result is produced by this transform. The whole process is schematized in Fig. 2.

II. Technical background

In this section, we detail this classical technique. The reader can find a more complete exposition in the work of Paul [1].

A. Important concept

An *important concept* is a type of object:

Definition 1 (Important concept)**.** *Given this and that, an object X is an important concept if it respects the following properties…*

B. Usual adaptation

This concept has been used for applications similar to ours [1], using the following formulation…

III. New technique or technique adaptation

Our technique aims at obtaining that result. It particularly suits to the problem since it is formulated as…

A. Formulation

B. Solution

C. Initialization and tuning

IV. Implementation

In order to reduce the resources needed for our method, we use the following implementation strategy.

A. Solver

B. Result display

V. Experiments

We validate our technique through a series of experiments.

First experiment: The first experiment checks this aspect of our method on perfect examples.

TABLE I
PERFORMANCES RESULTS: TIMINGS ARE EXPRESSED IN MILLISECONDS.

Data	Size	Ours	Previous	Gain
Data 1	50	0.1	1 000	x10^3
Data 2	100	0.2	2 000	x10^3
Data 3	500	0.8	10 000	x10^3
Data 4	1 000	1.2	20 000	x10^3
Data 5	5 000	1.9	100 000	x10^4
Data 6	10 000	2.1	200 000	x10^4

TABLE II
QUALITY MEASURES: TIMINGS ARE EXPRESSED IN MILLISECONDS.

Images	PSNR	MSE
Image 1	40.2	0.02
Image 2	30.9	1.02
Image 3	20.1	0.18

Second experiment: The second experiment checks the speedup obtained by the implementation strategy compared to previous technique [1].

Third experiment: The last experiment test our method on real data.

VI. RESULTS AND DISCUSSION

We performed the above-mentioned experiments on the following type of data: … For each data, we used the following tuning parameters of our method.

A. Performances

We report on Table I the performances of our technique on a computer at xxGhz with this graphic card. We observe that our technique outperforms previous approaches on this kind of data, and an equivalent result on this other kind of data.

Fig. 3. Quality assessment

B. Quality

As observed on Fig. 3, our method achieve good results in this situation. This can be measured by this criterion, and the results are reported on Table II.

C. Limitation

As mentioned in Section III, we expect our method to suit better this kind of data. On the other kind, this particularity does not fit into our formulation for this and that reason. Indeed, this can be observed in the results of Fig. 3. We plan to improve for that kind of data in future work. However, our technique performed well on this data, which does not respect our condition, since this other aspect reduced the negative impact of its characteristic.

VII. CONCLUSION

In this paper, we introduced this technique and showed that it is particularly appropriate for that application. We obtained this and that improvements, and plan to extend this application in that direction in future work.

ACKNOWLEDGMENT

The authors would like to thank this colleague and this financing institute.

REFERENCES

[1] *Proceedings of the XXVIII Conference on Graphics, Patterns and Images (SIBGRAPI).* Salvador, Brazil: IEEE, August 2015.