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Adaptive Approaches for Keystroke Dynamics

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The main contributions of this study are:

- Proposal of improvements over current adaptive algorithms (Usage Control 2 and IDB);
- Study of the behaviour of static and adaptive algorithms in a data stream context, showing their predictive performance over time;
- Detailed analysis on the behaviour of these algorithms over time under different aspects.

Keystroke Dynamics

Keystroke dynamics attempts to recognize users by their typing behaviour. In order to do that, time differences can be used, as shown below:

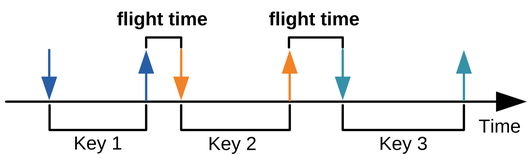
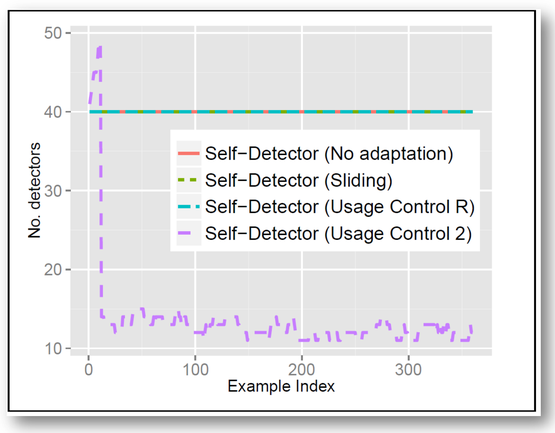


Figure from: P. H. Pisani, A. C. Lorena, and A. C. de Carvalho, "Adaptive positive selection for keystroke dynamics," Journal of Intelligent & Robotic Systems, pp. 1–17, 2014.

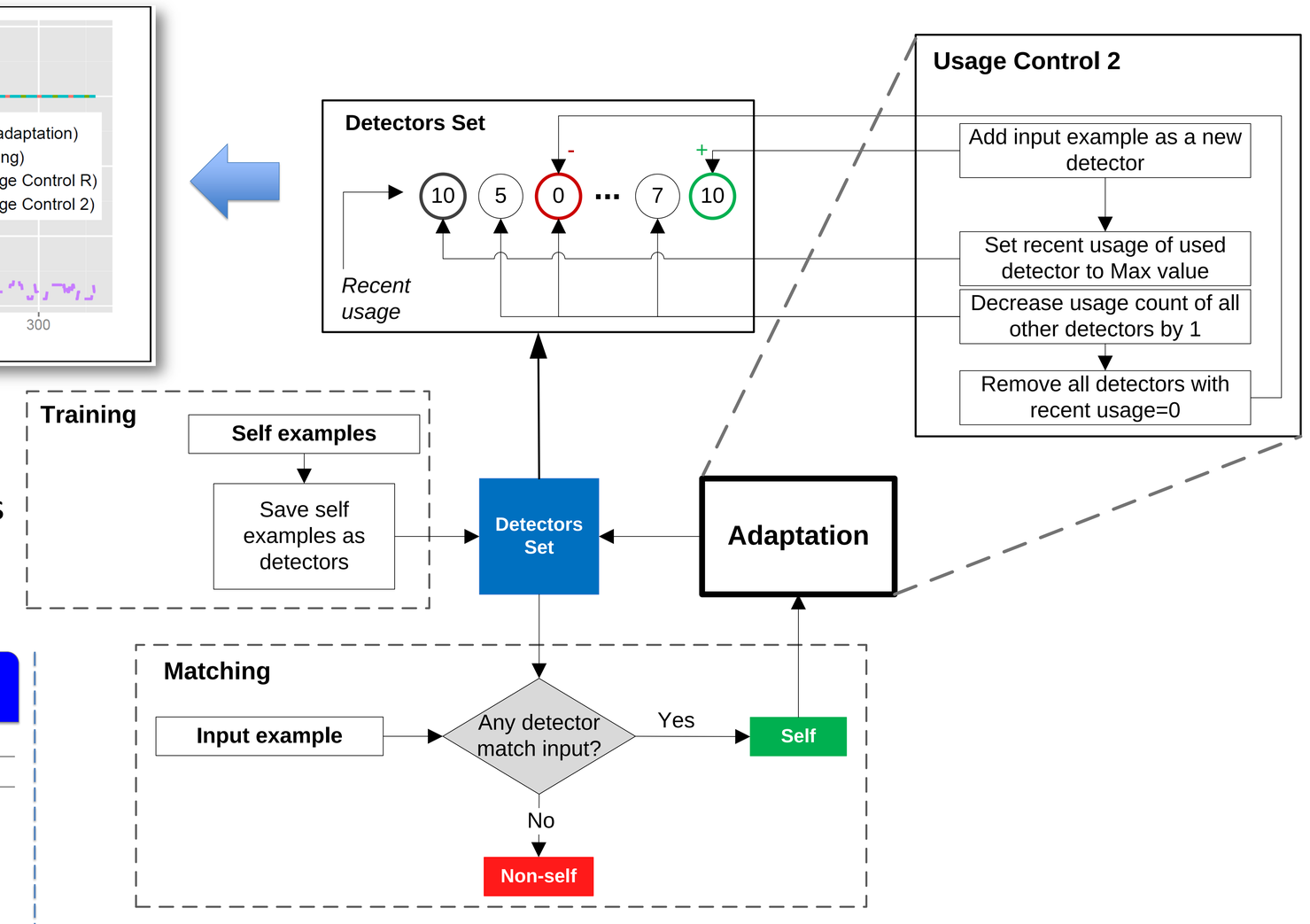
Datasets

	GREYC	CMU	GREYC-Web
No. of users	100	51	35
No. of examples (avg per user)	67.49	400	213.26
Expression	"greyc laboratory"	".tie5Roanl" + *Enter* key	"laboratoire greyc"
No. of characters	16	11	17
Age (years)	19 - 56	18 - 70	19 - 39
Gender (aprox.)	73% (males) / 27% (females)	59% (males) / 41% (females)	71% (males) / 29% (females)

Adaptive Self-Detector: Usage Control 2



Usage Control 2 keeps changing the amount of detectors over time.



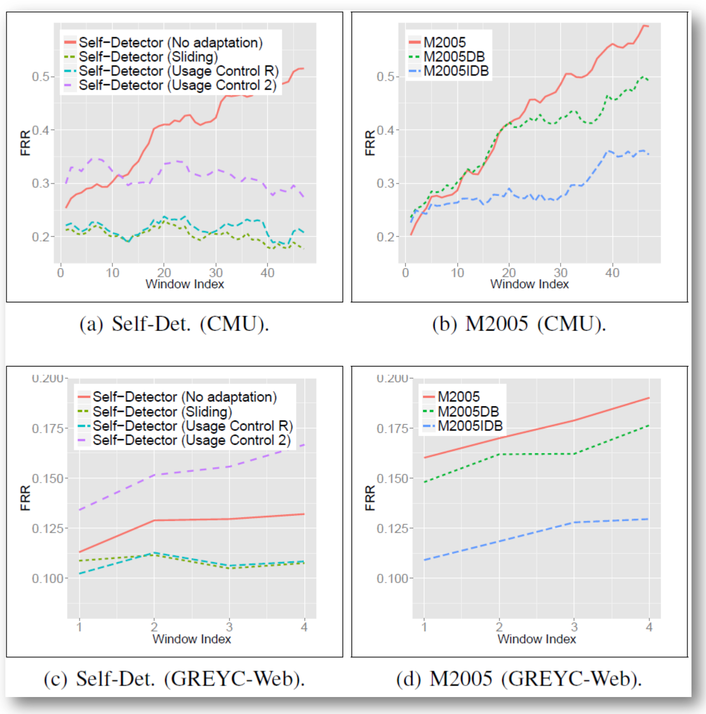
***Adaptive Self-Detector* model** studied in [Pisani et al., 2014]. Standard (non-adaptive) *Self-Detector* does not have the *Adaptation* step. This work modified the *Adaptation* step, named as *Usage Control 2* in this paper.

Experimental Results

Adaptive algorithms have a tendency to obtain lower FRR and to maintain Correlations at a higher value over time (it indicates that the user model kept closer to the current user behaviour). *Usage Control 2* obtained lower FAR over time (see graph in the paper).

FRR over time

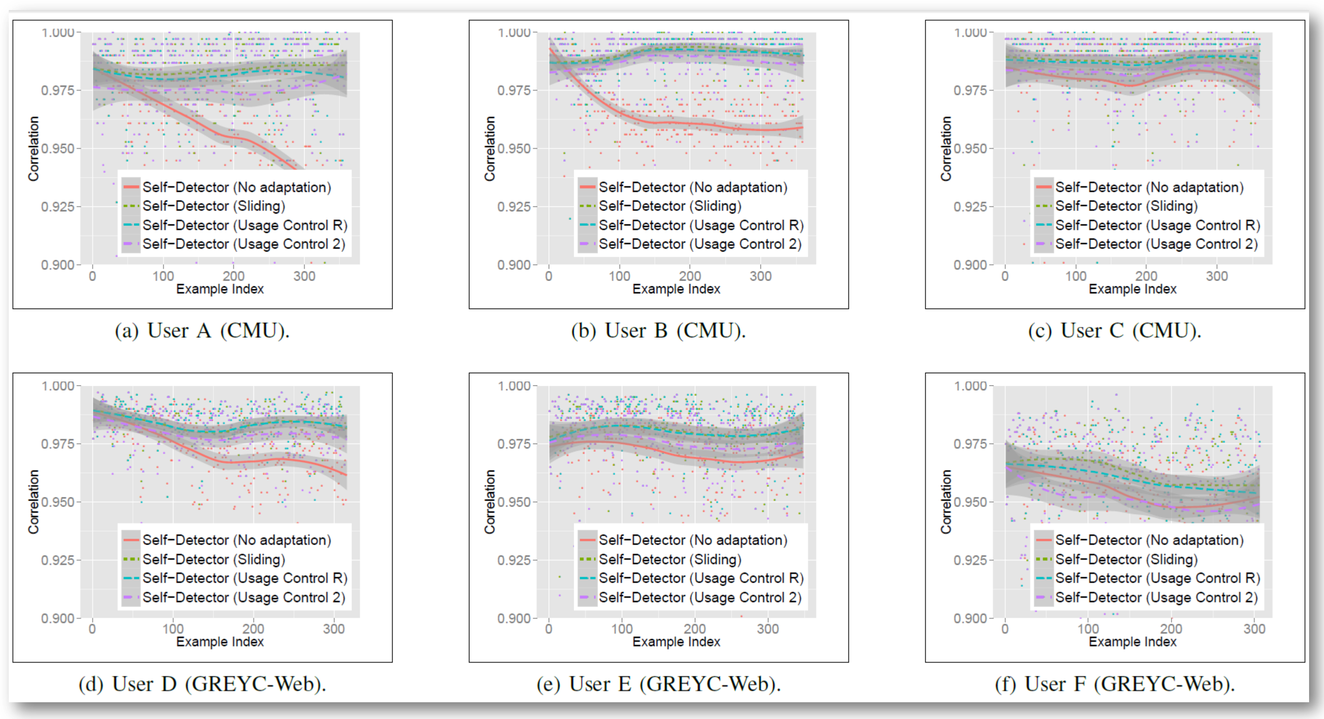
FRR (False Rejection Rate): the rate in which the legitimate user is wrongly rejected by the system. FAR (False Acceptance Rate) is the rate in which intruders are wrongly accepted by the system. For both FRR and FAR, the lower the better.



(a) Self-Det. (CMU). (b) M2005 (CMU). (c) Self-Det. (GREYC-Web). (d) M2005 (GREYC-Web).

Correlation over time

It shows the correlation between each positive example and the closest detector (only for Self-Detector). The higher the better.



(a) User A (CMU). (b) User B (CMU). (c) User C (CMU). (d) User D (GREYC-Web). (e) User E (GREYC-Web). (f) User F (GREYC-Web).

Figures used here are either from the paper or were designed specifically for this poster (except the first figure, which has an explicit citation).
All references used in this study are specified in the full paper at IJCNN 2015: "Adaptive Approaches for Keystroke Dynamics".

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