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PAPER

Smash++: finding rearrangements

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Abstract

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Key words: Keyword1; keyword 2; keyword 3 (Three to ten keywords representing the main content of the article)

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Key Points

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- This is the second point
- One last point.

Table 1. An example table.

Item	Quantity	Notes
Widgets	42	Over-supplied*
Gadgets	13	Under-supplied

This is a table note.
*Another note.

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- This is a numbered list.
- Another point.
- A third point.

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Figures and tables can be added with the usual `figure` and `table` environments, e.g. Figure 1 and Table 1. Use `figure*` and `table*` if you need a two-column wide figure or table, as in Figure 2 and Table 2.

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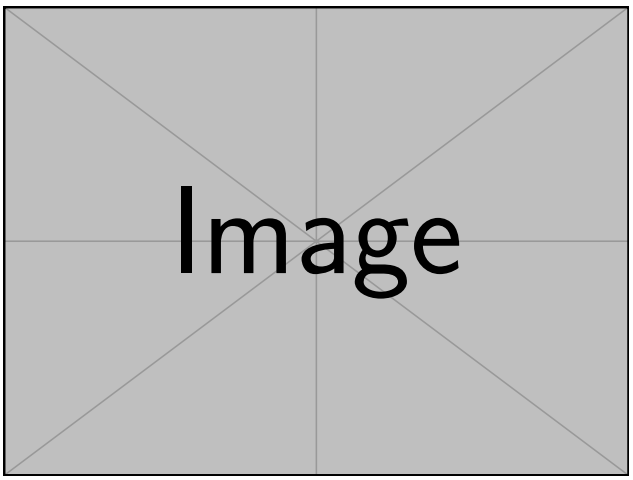

Figure 1. An example figure

Some Mathematics Sample

Let $X_1, X_2, \ldots, X_n$ be a sequence of independent and identically distributed random variables with $\mathrm{E}[X_i] = \mu$ and $\mathrm{Var}[X_i] = \sigma^2 < \infty$, and let

$$S_n = \frac{X_1 + X_2 + \cdots + X_n}{n} = \frac{1}{n}\sum_{i}^{n} X_i \qquad (1)$$

denote their mean. Then as n approaches infinity, the random variables $\sqrt{n}(S_n - \mu)$ converge in distribution to a normal $\mathcal{N}(0, \sigma^2)$.

Background

The background section should be written in a way that is accessible to researchers without specialist knowledge in that area and must clearly state—and, if helpful, illustrate—the background to the research and its aims. The section should end with a brief statement of what is being reported in the article.

Data Description

A statement providing background and purpose for collection of these data should be presented for readers without specialist knowledge in that area. A brief description of the protocol for data collection, data curation and quality control, as well as potential uses should be included, as well as outlining how the data can be accessed if it is not deposited in our repository.

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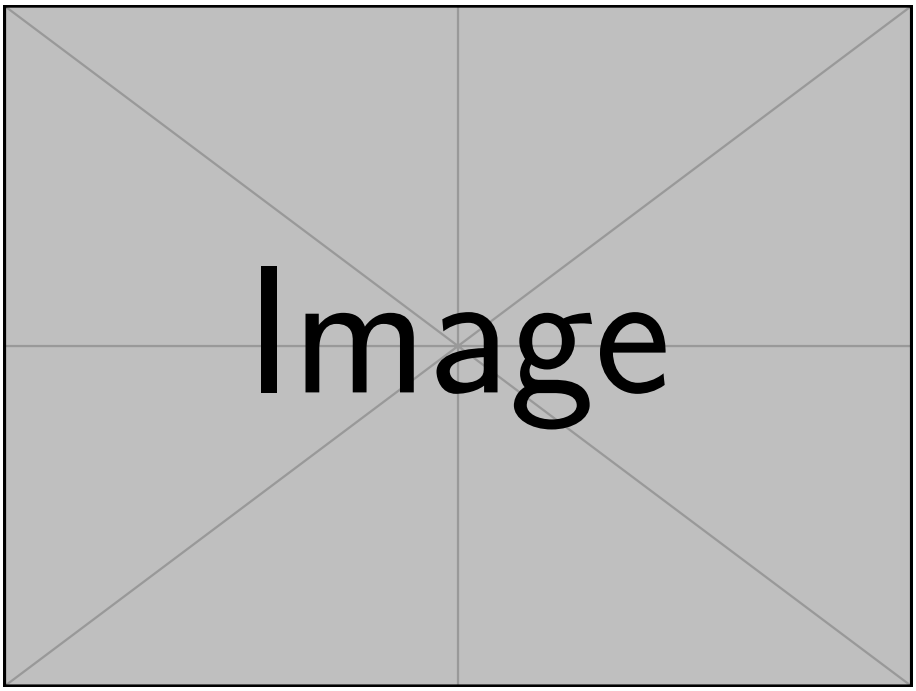

Figure 2. An example wide figure. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Table 2. Automobile land speed records (GR 5-10)

Speed (mph)	Driver	Car	Engine	Date	Extra comments
407.447	Craig Breedlove	Spirit of America	GE J47	8/5/63	(Just to demo a full-width table with auto-wrapping long lines)
413.199	Tom Green	Wingfoot Express	WE J46	10/2/64	
434.22	Art Arfons	Green Monster	GE J79	10/5/64	
468.719	Craig Breedlove	Spirit of America	GE J79	10/13/64	
526.277	Craig Breedlove	Spirit of America	GE J79	10/15/65	
536.712	Art Arfons	Green Monster	GE J79	10/27/65	
555.127	Craig Breedlove	Spirit of America, Sonic 1	GE J79	11/2/65	
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600.601	Craig Breedlove	Spirit of America, Sonic 1	GE J79	11/15/65	
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633.468	Richard Noble	Thrust 2	RR RG 146	10/4/83	
763.035	Andy Green	Thrust SSC	RR Spey	10/15/97	

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paper. The authors should make clear the goal of each analysis and state the basic findings.

Discussion

The discussion should spell out the major conclusions and interpretations of the work, including some explanation on the importance and relevance of the dataset and analysis. It should not be restatement of the analyses done and their basic conclusions. The discussion section can end with a concluding paragraph that clearly states the main conclusions of the research along with directions for future work. Summary illustrations can be included.

Potential implications

Authors should provide some additional comments about potential, more broad-ranging implications of their work that are not directly related to the current focus of their manuscript. This section is meant to promote discussion on possible ways the findings or data presented might be used in or have a relationship with other areas of research that may not be directly apparent in the work. It is not meant to provide 'proof of importance' of the work. Only to engender expansion of use to other areas.

Explicit personal opinions by the authors are permitted, but they should be made clear as such. References or related information to support the propositions should be included. These section should focus on work that can be done within the foreseeable future and specifically using the information within the manuscript, not provide speculation on how it will relate to far-reaching goals of the research area.

Methods

The schema of the proposed method is illustrated in Figure 3. Smash++ takes as inputs a reference and a target file and produces as output a position file, which is then fed to the Smash++ visualizer to produce an SVG image. This process has eight major stages: (1) compression of the original target file, based on

the model of original reference file, (2) filtering and segmentation of the compressed file, (3) reference-free compression of the segmented files, obtained by the previous stage, (4) compression of the original reference file, based on the model of segmented files obtained by stage 2, (5) filtering and segmentation of the compressed files, (6) reference-free compression of the segmented files, that are obtained by the stage 5, (7) aggregating positions, generated by stages 3 and 6, and (8) visualizing the positions. The following sections describe the process in detail.

Data modeling

Smash++ works on the basis of cooperation between finite-context models (FCMs) and substitutional tolerant Markov models (STMMs). Applying these models on various contexts provides probability and weight values, illustrated in Figure 4a, which are then mixed (by multiplication and addition, shown in Figure 4b) to provide the final probability (P) of occurring an input symbol. The following subsections describe FCMs and STMMs in detail.

Availability of source code and requirements (optional, if code is present)

Lists the following:

- Project name: e.g. My bioinformatics project
- Project home page: e.g. http://sourceforge.net/projects/mged
- Operating system(s): e.g. Platform independent
- Programming language: e.g. Java
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Data Citation Synthesis Group: Joint Declaration of Data Citation Principles. Martone M. (ed.) San Diego CA: FORCE11; 2014 [https://www.force11.org/datacitation]

Table 3. Automobile land speed records (GR 5–10). This is the same table as before, but rotated sideways.

Speed (mph)	Driver	Car	Engine	Date	Extra comments
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413.199	Tom Green	Wingfoot Express	WE J46	10/2/64	
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526.277	Craig Breedlove	Spirit of America	GE J79	10/15/65	
536.712	Art Arfons	Green Monster	GE J79	10/27/65	
555.127	Craig Breedlove	Spirit of America, Sonic 1	GE J79	11/2/65	
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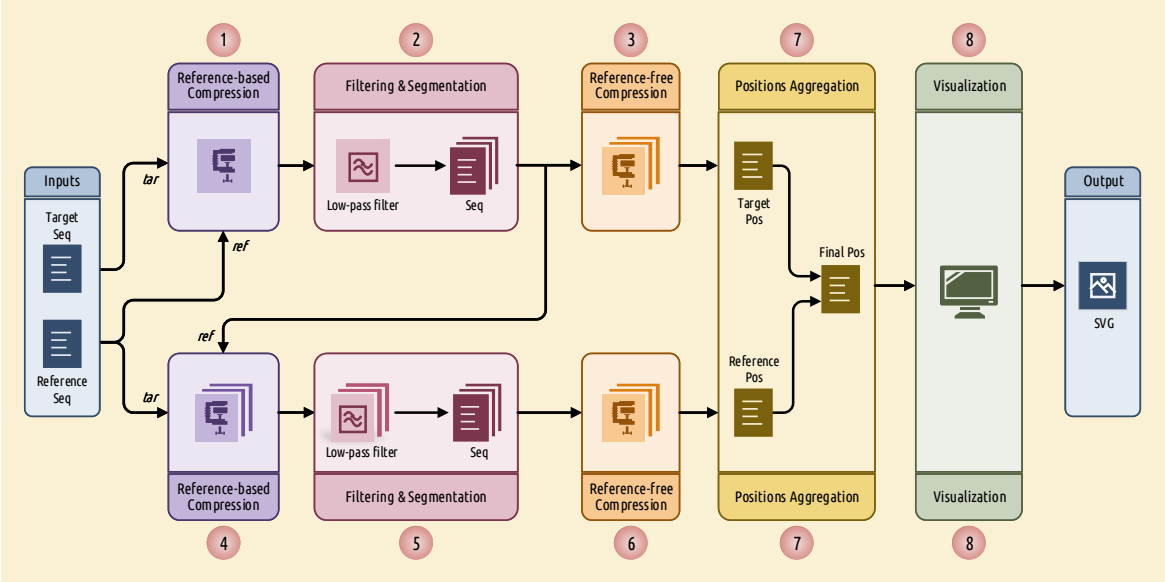

Figure 3. The schema of Smash++. The process of finding similar regions in reference and target sequences and also, computing redundancy in each region includes eight stages. Finally, Smash++ outputs a *.pos file that includes the positions of the similar regions, and can be then visualized, resulting in an SVG image.

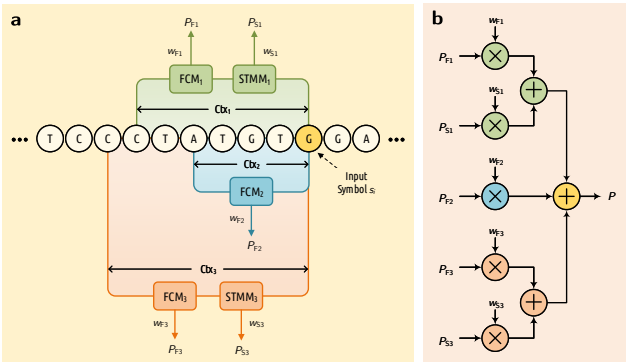

Figure 4. Data modelling by Smash++. (a) cooperation between finite-context models (FCMs) and substitutional-tolerant Markov models (STMMs). Note that each STMM needs to be associated with an FCM. (b) probability of an input symbol is estimated by employing the probability and weight values that have been obtained from processing previous symbols.

A list of available scientific research data repositories can be found in res3data and BioSharing.

Declarations

List of abbreviations

CPU: central processing unit; FCM: finite-context model; RAM: random access memory; STMM: substitutional-tolerant Markov model;

Ethical Approval (optional)

Manuscripts reporting studies involving human participants, human data or human tissue must:

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Competing Interests

The authors declare that they have no competing interests.

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2. Cox DR. Regression models and life tables (with Discussion). J R Statist Soc B 1972;34:187–220.
3. Heard NA, Holmes CC, Stephens DA. A Quantitative Study of Gene Regulation Involved in the Immune Response of Anopheline Mosquitoes: An Application of Bayesian Hierarchical Clustering of Curves. J Am Statist Assoc 2006;101:18–29.

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