

Characterising User Interactivity For Sport Video-on-Demand

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Motivation

We wished to gain insight into how users would interact with next generation interactive TV. Unfortunately, no suitable data was publicly available. We therefore ran our own experiment, allowing us to study the effects of advanced interactive functionality. From our results we were able to draw several conclusions, and also derive models to drive future simulation work.

Methodology

To achieve our goals, a custom web-based Video-on-Demand system was created and advertised to the staff and students of Lancaster University. Logs of all user actions were recorded over approximately a 5 week period around the 2006 FIFA World Cup, which was the primary source of content. Analysis was then performed on the logs, allowing users' interactions with our system to be characterised.

Results

We found that bookmarks highly influence the behaviour of users. The increased popularity of video around the bookmarks in Figure 1 and the high usage of the bookmark controls in Figure 2 clearly illustrate this fact. The access patterns observed were therefore an obvious departure from the standard start-to-finish playback model found in many other studies.

We also noted that users spent very little time viewing the video relative to its length, and would often quickly move between points of interest as shown in Figure 3. For this type of content, therefore, this impacts the usefulness of existing techniques for video delivery across the Internet.

Figures 4 and 5 show that users would view bookmarks in a similar manner. Accordingly, strategies can be developed to exploit the predictability of their behaviour. We therefore derived several models to help generalise and reproduce the access patterns observed, as presented in Table 1.

Metric	Distribution
Object Popularity	Normal, $\mu = 33.20, \sigma = 17.10$
Segment Popularity	Log-normal, $\mu = 0.016, \sigma = 1.35$
Session Size	Log-normal, $\mu = 4.835, \sigma = 1.704$
Inter-seek Times	Log-normal, $\mu = 1.4796, \sigma = 2.2893$
Bookmark Longevity	Weibull, $\lambda = 1.814, k = 0.6383$

Table 1 - Models and associated parameters derived from gathered traces

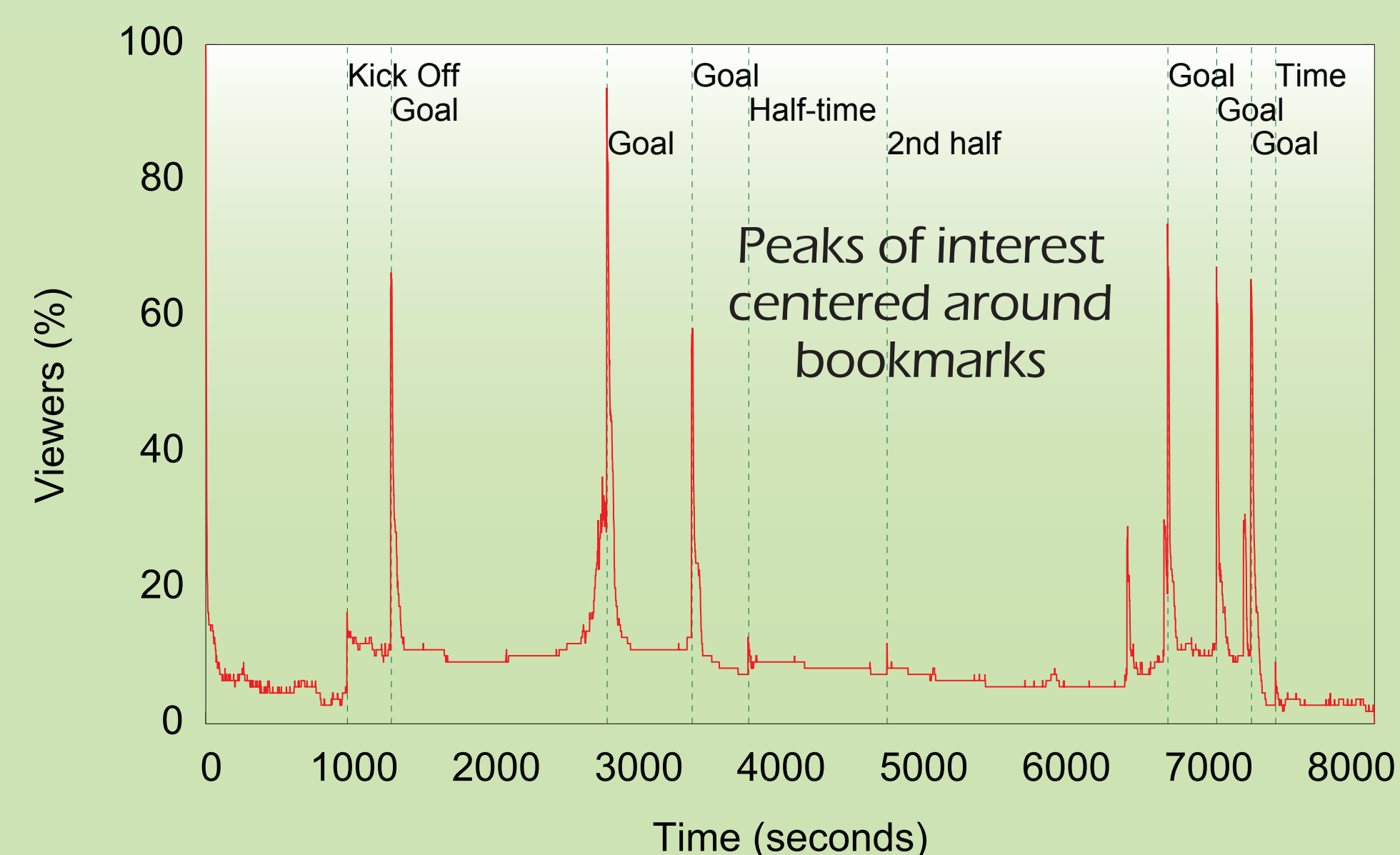


Figure 1 - Second by second popularity of the Argentina vs. Serbia & Montenegro match

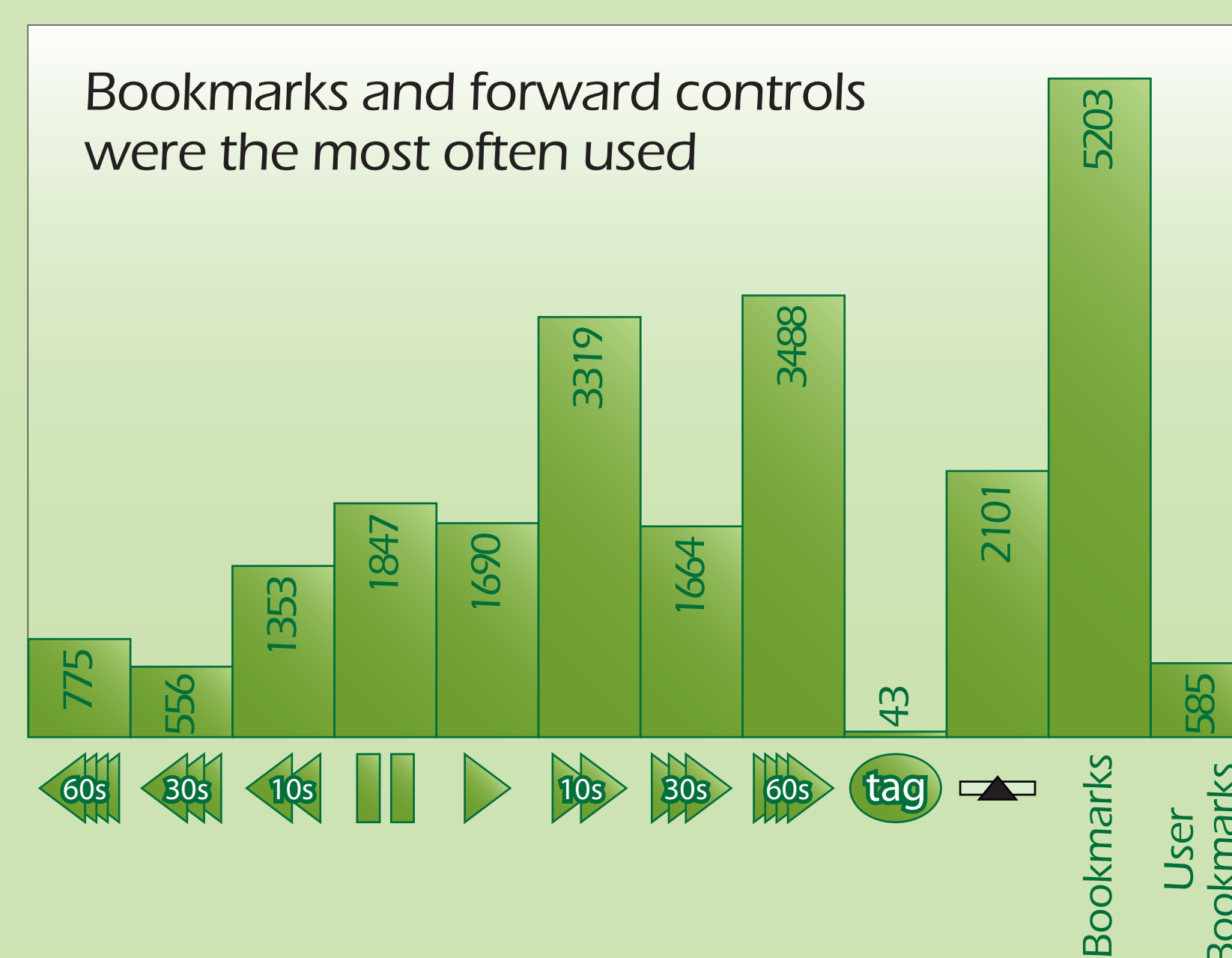
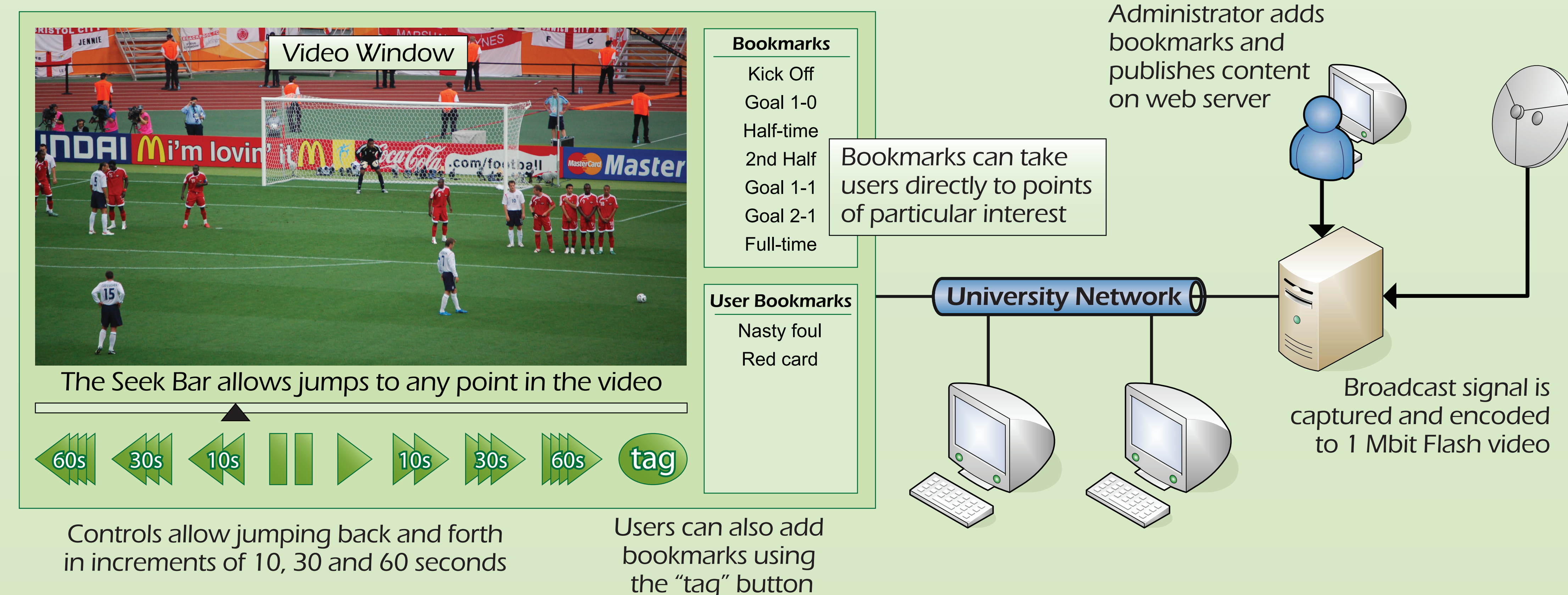


Figure 2 - Control Usage Frequency



Outlook

As noted, our content contained multiple segments of high interest, which we refer to as "hotspots". The automatic detection of these areas as they develop would allow the system to respond to them, aiding in efficient delivery. Furthermore, bookmarks could automatically be placed on detected hotspots to enable users to discover interesting content more easily. Future work will therefore involve investigation into these topics, while also studying a wider range of video genres that may exhibit hotspots, such as other sports, music videos, news programmes and so on.

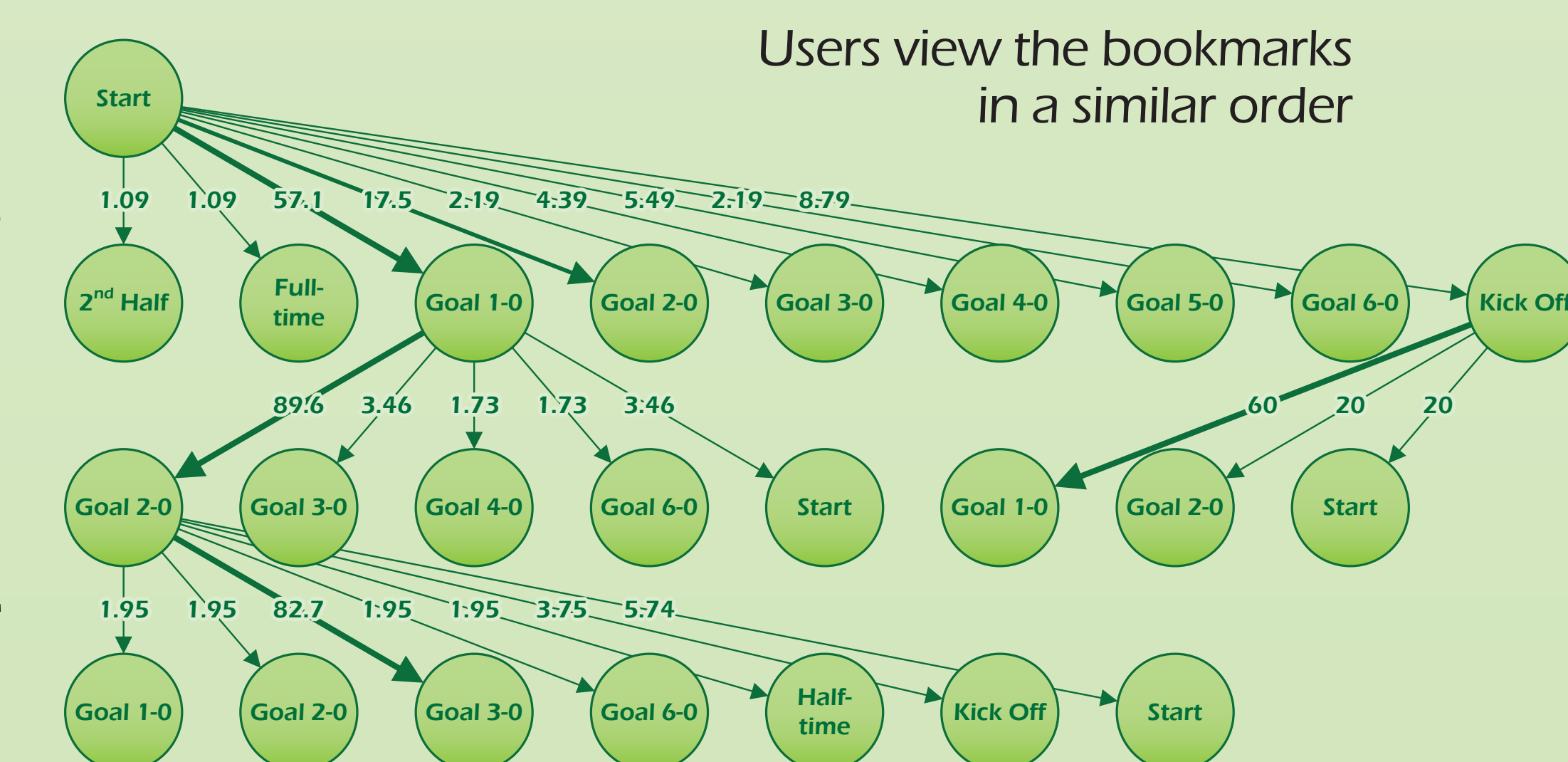


Figure 5 - Bookmark traversal probability tree

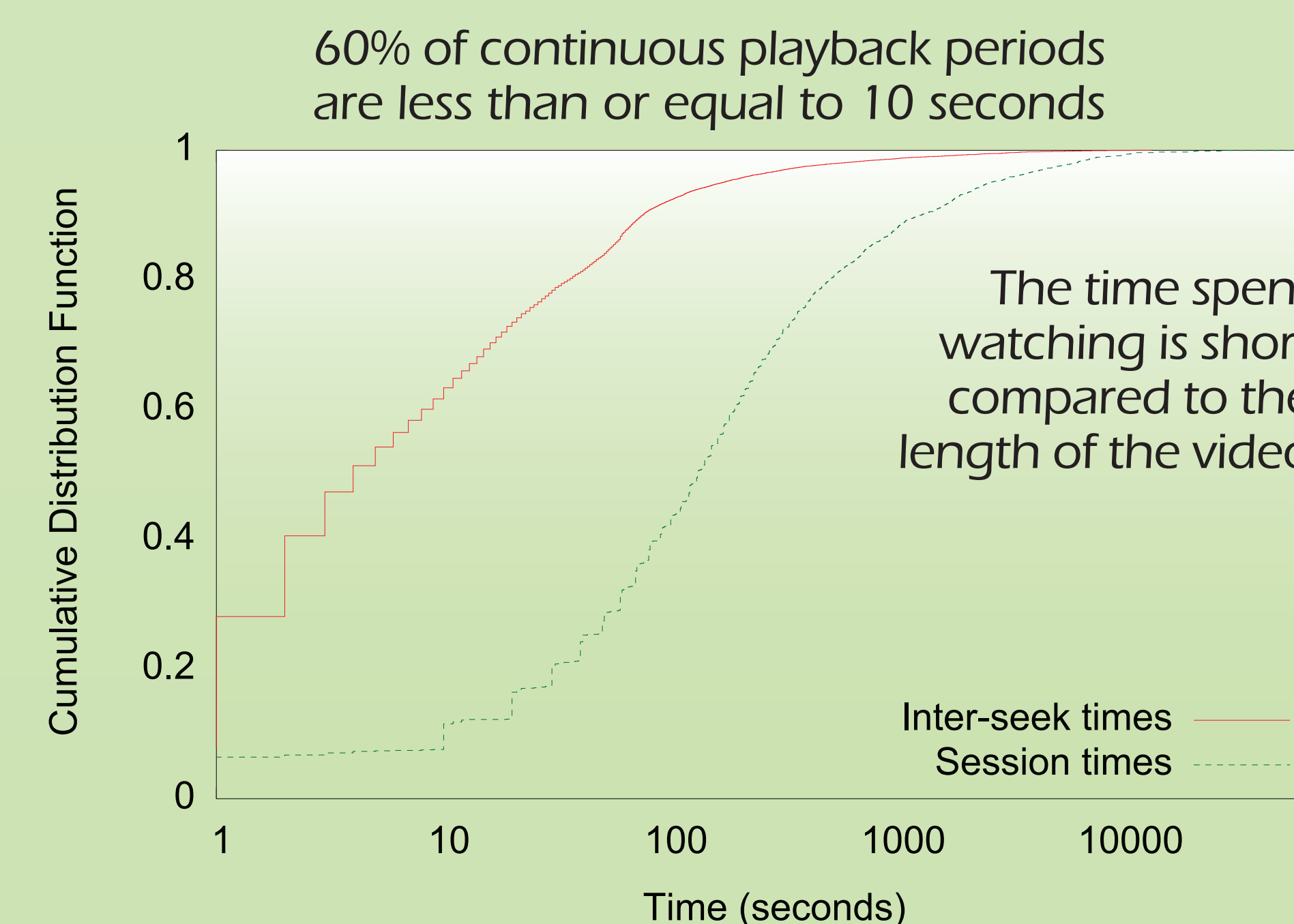


Figure 3 - CDF of session lengths and inter-seek times

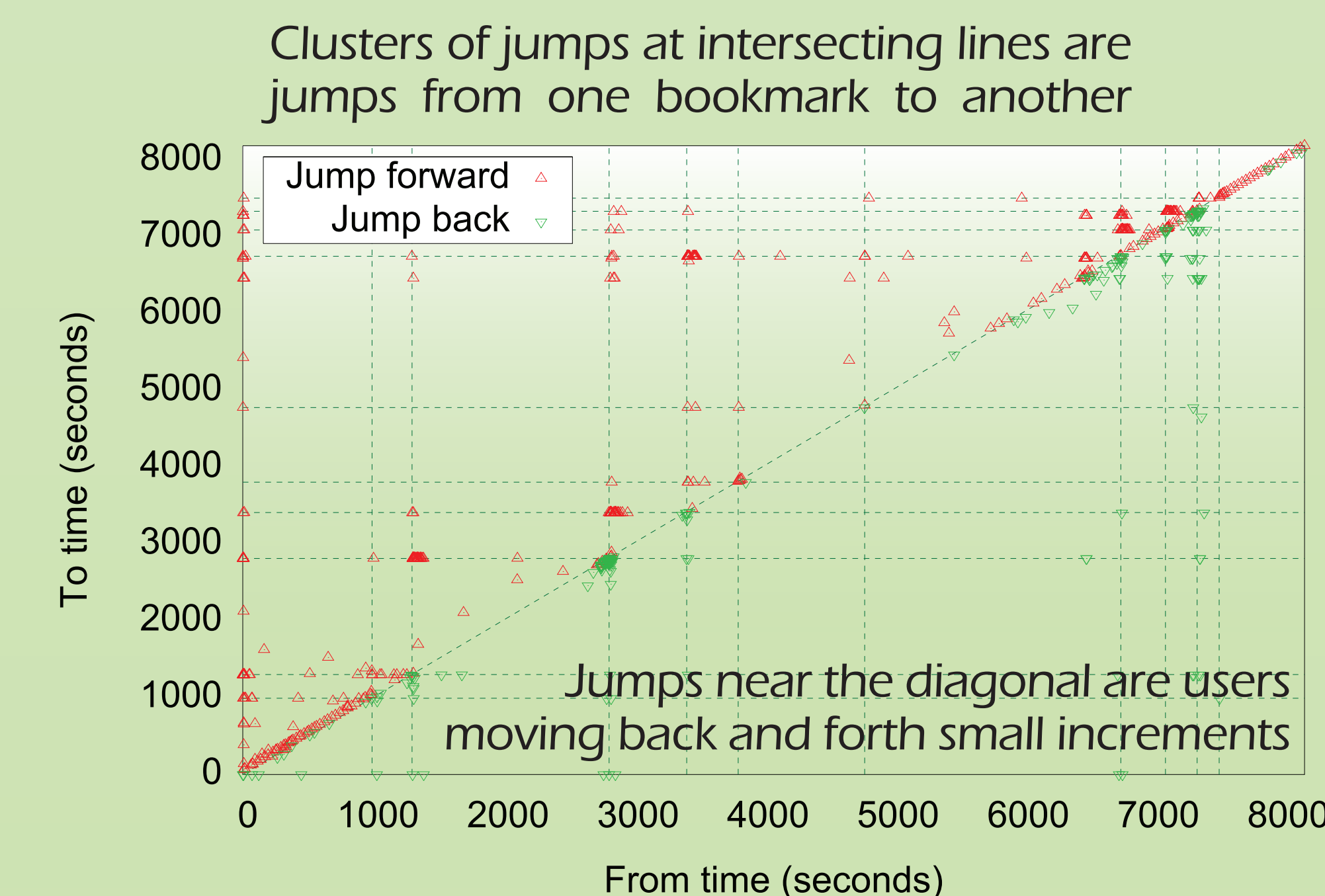


Figure 4 - Jumps made by users within the Argentina vs. Serbia & Montenegro match