The Role of Exploration and Forward Checking in Human Scheduling

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Research Objective: Connecting two strategies

We investigated how human participants work with the interactive Plan-A-Day (PAD) task (Funke & Krüger, 1993), which implements the task of scheduling numerous appointments during a fictitious day. We postulate that two strategies work together to enhance scheduling performance. The first strategy, remindful of instance based learning (cf. Logan, 1988) is to *explore* the feasibility of specific partial schedules by entering them into the PAD Interface. The second strategy, remindful of *forward checking* for Constraint Satisfaction Search (e.g. Russell & Norvig, 1995), checks in advance whether meeting an appointment would render another appointment impossible. In order to "verify" the results of forward checking, a certain amount of exploration is necessary, and in order to restrain exploration, forward checking is necessary. We conducted a study to determine which patterns of exploration are present in human scheduling and to validate our assumption that forward checking increases between two different PAD tasks.

Empirical results

The results reported in this section were obtained by presenting 43 student participants with two different PAD tasks (PAD 4 and PAD 5; a more detailed account of the analytic procedure can be found in Nellen, 2002).

Patterns of Exploration

The number of times participants modify their schedules during a PAD session is positively correlated with the number of complete restarts ("R"; abandoning a schedule completely and placing another appointment at the start), the number of different appointments placed at the start of a schedule ("Dif".), and negatively with the mean length ("ML") of the tried schedules. This pattern is consistent with exploration aimed at collecting a wide variety of experiences.

Table 1: Correlations between the number of schedule modifications and other process measures (explained in the text). Asterisks indicate significance at the level of $p<.01$ according to Fisher's Z test for correlations.

(N=43)	# of modifications PAD 4	# of Modifications PAD 5
R	-.57***	-.461***
Dif	.74***	.665***
ML	.61***	.556***

Increase in forward checking

The amount of forward checking in the data was assessed by computing the percentage of "deliberate" modifications that are performed *before* participants are too late at an appointment, relative to the total number of modifications. Table 2 shows the considerable increase of forward checking between the two PAD tasks.

Table 2: Increase of the percentage of deliberate modifications (forward checking) between the two PAD tasks.

	Deliberate modifications	
	PAD 4	PAD 5
average	41.7 %	59.6 %
median	44.0 %	58.0 %
mode	0.0 %	100 %

Conclusion

Participants consistently explore the feasibility of partial schedules. However, they also acquire the skill of forward checking between two PAD tasks, resulting in an enhanced quality of the exploration, which now yields fewer dead ends. The quick and considerable increase of forward checking suggests a mechanism of skill acquisition as production composition as defined by Anderson (1987); while the continuous presence of exploration implies that the importance of specific experiences throughout the scheduling process.

References

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