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Markov Decision Processes and the Cutting Problem

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In January 2007, I took a vacation scholarship at Monash University under the supervision of Dr Kais Hamza. The topic I studied was the Markov Decision Processes and the Cutting Problem. This project came from a real case study, where a company sells carpet and will cut up the carpet rolls according to customer specifications. The aim of this project was to aim to minimise the overall cost, eg:

- Minimise the number of rolls held in stock
- Minimise waste carpet
- Missed sales due to no available lengths.

Two strategies were considered:

- Cut the shortest used carpet roll that is longer than the order
- Cut the longest used carpet roll that is longer than the order

Markov decision processes were used to model this type of random phenomena affected by policies taken by the decision-maker in order to optimise certain outcomes. Markov decision processes are an extension of Markov chains; the difference is the addition of actions (allowing choice) and rewards (giving motivation). Due to the complexity, programming and simulations were used for approaching this problem.

Overall, this was a very interesting project, which I am glad that I was given the opportunity to undertake. Also, it was a great opportunity for me to meet other vacation scholars. It has been an invaluable time which certainly gave me some new directions in my future studies. I am particularly grateful for the support of AMSI/ICE-EM, Monash University and Dr Kais Hamza.

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See http://www.ice-em.org.au/students.html#scholarships2007