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in

Cognitive modeling for robotics in manufacturing

TOWARDS SEQUENTIAL PROBLEM SOLVING IN ACT-R: A CASE STUDY OF TANGRAM

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ISA dedication

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Chapter 1

Introduction

Where I describe cogntive modelling and its applications, and the specific case study of the tangram in the context manufacturing and tutoring

Cognitive architectures and AI [1]

Chapter 2

Related Works

Where I quickly go throught the available Literature, describe ACT-R and its functioning and analyze the various approaches for tangram solving

2.0.1 ACT-R

2.0.2 Cogntive modelling of puzzles

Despite their nature and potential as an abstraction for more sophisticated sequential problem solving tasks, the applicaions of cognitive modelling to puzzles are still at an early stage.
Rosenberg et al. [3] coupled cognitive architectures and the tangram puzzle in order to model the curiosity aspect of a social robot, but the actual solution of the puzzle was implemented with a connectionist approach and the cognitive aspect was focused on the social interaction and artificial curioisy modelling.
Gentile and Lieto [2] instead used ACT-R in order to model the role of mental rotation applied at the task of the Tetris^{TM} video-game, based on the previous work of Shepard and Metzler[4], providing introductory results and a functioning model for the mental rotation process.

2.0.3 The Tangram

Chapter 3

Experimental scenario

Where I describe the performed experiments

Chapter 4

Data Analysis and Hypothesis

Where I qualitatively and quantitatively analyze the available data, provide figures and introduce the leading Hypothesis that the model will try to explain

Chapter 5

Model description

Where I provide a detailed description of the model and the modelling choices

Chapter 6

Results and discussion

Where I compare the model to the expected data and try to discuss whether the hypothesis are funded and whether there are possible applications

Bibliography

[1] L. A., B. M., O. A., and V. D. The role of cognitive architectures in general artificial intelligence. *Cognitive Systems Research*, 48:1–3, 2018. DOI: 10.1016/j.cogsys.2017.08.003. URL: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85028355583&doi=10.1016%2fj.cogsys.2017.08.003&partnerID=40&md5=86d65b9707a233d2bde94e786841e92a. Cited by: 46; All Open Access, Green Open Access.

[2] M. Gentile and A. Lieto. The role of mental rotation in tetristm gameplay: an act-r computational cognitive model. *Cognitive Systems Research*, 73:1–11, 2022. ISSN: 1389-0417. DOI: https://doi.org/10.1016/j.cogsys.2021.12.005. URL: https://www.sciencedirect.com/science/article/pii/S1389041721000991.

[3] M. Rosenberg, H. W. Park, R. Rosenberg-Kima, S. Ali, A. K. Ostrowski, C. Breazeal, and G. Gordon. Expressive cognitive architecture for a curious social robot. *ACM Trans. Interact. Intell. Syst.*, 11(2), 2021. ISSN: 2160-6455. DOI: 10.1145/3451531. URL: https://doi.org/10.1145/3451531.

[4] R. N. Shepard and J. Metzler. Mental rotation of three-dimensional objects. *Science*, 171(3972):701–703, 1971.

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