Technologies to support motor skill learning - musical instruments

Chaoneng Xie
Chaoneng.Xie@campus.lmu.de
LMU Munich
Munich, Germany

ABSTRACT

Music education has a tendency to lean towards its tradition, learning of a traditional acoustic instrument such as piano or violin requires observation of established discipline. The standards of a good musical performance and ways of learning and practicing has seldom changed through the years. However, educaters and researchers are always looking for a better way of teaching and practicing. In this digital age, especially after the impact of the pandemic, the innovation of music education is going slowly but continously. New devices and technologies are invented and experimented to provide music learners a better and easier learning experience. In this paper we investigate and review these new technologies. We conducted a literature search using keywords "motor skill", "motor learning", "musical instrument" and "piano" in the following databases: *ACM*, *Springer* and *IEEE Xplore*.

We will classify and compare these different technologies in regarding to supporting the learning of a musical instrument, and evaluate their effektivness. With this result we will try to predict the possible directions of this field of study in the future.

CCS CONCEPTS

• **Human-centered computing** → *HCI theory, concepts and models.*

KEYWORDS

motor skill, motor learning, musical instrument, piano

1 INTRODUCTION

1.1 What is a Good Musical Performance?

- In the aspekt of traditional music appreciation.
- In the aspekt of motor skill.

1.2 Techniques of Learning and Practicing Musical Instruments

- The traditional way of learning and practicing musical instruments.
- Why these techniques needs improvement and possible approaches.

1.3 The Objective of this Review

- Present a systematic review of the studies around the topic.
- Compare and evaluate the effektivness of different technologies.
- The future direction of this field of study.

2 METHODOLOGY

2.1 Date Sources and Search Strategies

- The databases in which the search is conducted: *ACM*, *IEEE Xplore*, *Springer* etc.
- The keywords, their combinations and variations used in the search: **motor skill**, **motor learning**, **musical instrument**, **piano**

2.2 Selection Criteria and Procedures

2.2.1 Selection Criteria.
- Studies that develop and experiment with physical equipment are considered target of this search.
- Studies with emphasis on motor skill learning are given high relevance.
- The time period of the studies needs to be determined.

2.2.2 Selection Procedures.
- The time the search is performed, and who performed it.
- Initial collection of articles: title-abstract screening, duplicat elimination.
- Full text analyze and evaluation.
- Progressive inclusion of related studies cited in the article during the process.

2.3 Comparison Criteria and Procedures

- First a classification of reviewed studies will be performed. A general classification of the reviewed studies to date are *Haptic/Stimulation*[1], *Visual*[2] and *Other/Combined*[3].
- The comparison of the technologies appeared in the studies, both between and within their classifications.

3 RESULTS

- An overview of the search results. General description of the search and selection process.

4 DISCUSSION

4.1 Classification of the Studies

- Haptic/Stimulation
- Visual
- Other/Combined

4.2 Comparison and Evaluation of the Effectiveness of Different technologies.

- First, compare technologies from different studies within the same classification.
- Second, a comparison between the different classifications.

5 CONCLUSION

- Summary of the comparison. Listing of the strength and shortcomings of different classifications.
- Listing of the possible directions of future studies in their respective fields.

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