MoBeyBou - Tangible Interfaces for Cognitive Development

Master in **Electronics and Computing Engeneering**

Hugo Baptista Lopes [1] | Vítor Carvalho[1] | Cristina Sylla [2]

1 – IPCA | 2 – UM

▶ BACKGROUND

Interfaces that allow interaction with the virtual world are increasingly object of study and application today. From games to education and teaching [1], there has been a significant increase of different forms and methods that transpose the physical world into the virtual. One example are Digital manipulatives (DMs), which use physical objects to interact with digital content, Figure 1. Therefore, interfaces that combine the latest technology with physical objects, promoting children's cognitive development have the potential to advance recurrent teaching methods.

TUI can play an important role in the "decoding" of complex systems and, on the other hand, it is important that the interface is easy to approach, even when difficult to master, encouraging the involvement of people with varied backgrounds and levels of experience [2].

Figure 1 – TOK [3]

▶ OBJECTIVES

The objective of this work is to create a tangible object capable of interacting with the virtual world, Figure 3. This object will have the ability to react to a sensory stimulus when alone or to interact with other objects when they are close to each other [4], Figure 2.
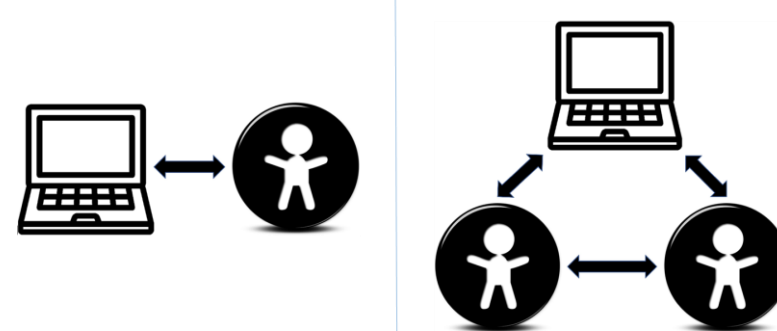

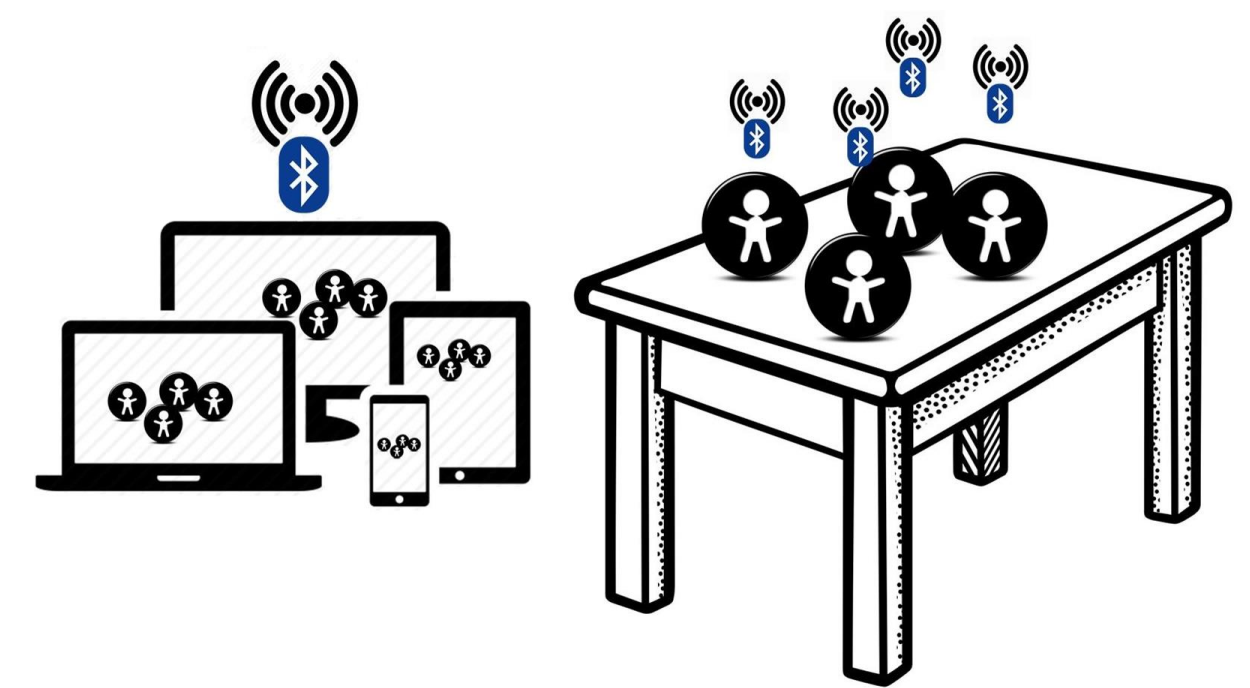*Figure 2 – Positioning Interaction*

Figure 3 – Game Components

▶ METHODOLOGY

It will be developed an interface and API, Figure 5, that contains all the integration of the power connections and communications - through a PCB. The physical parts [5], in this context denominated blocks, Figure 4, will be developed through plastic using a 3D printer with the integration of the technological part into account.
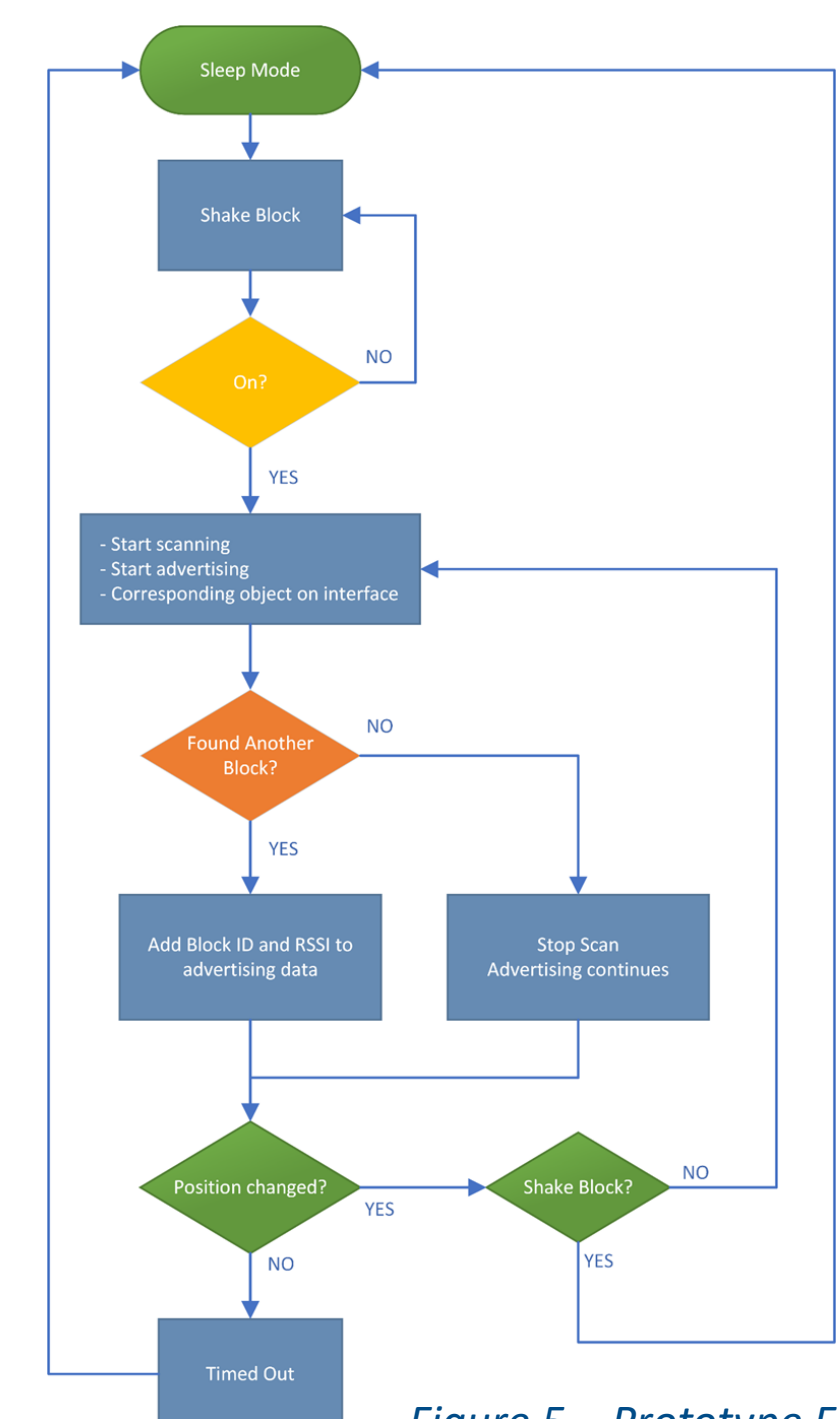

Figure 4 – Block characters

Figure 5 – Prototype Flowchart

▶ RESULTS AND CONCLUSIONS

The game will be subjected to a series of tests, Figure 6, from prototyping to field testing, to prove the effectiveness of the new method comparing to the existing one. This results will then be analysed by other cientific fields to prove the impact of the DMs on children's cognitive development, Figure 7.

Figure 6 – Interaction (TOK[2])

Figure 7 – Game play (TOK[2])

▶ BIBLIOGRAPHY

[1] Piaget, J., 1952. The origins of intelligence in children. New York, NY, USA: University Press.

[2] Yildirim, M., & Tinapple, D. (2013). AntsWorld - A tangible interface for an interactive ant foraging simulator. 2013 5th International Conference on Games and Virtual Worlds for Serious Applications, VS-GAMES 2013, 0–3.

[3] Sylla, C., Pereira, I. S. P., Coutinho, C. P., & Branco, P. (2016). Digital Manipulatives as Scaffolds for Preschoolers’ Language Development. IEEE Trans. Emerg. Topics Comput. IEEE Transactions on Emerging Topics in Computing, 4(3), 439–449.

[4] Sylla, C., Coutinho, C., Branco, P., & Müller, W. (2015). Investigating the use of digital manipulatives for storytelling in pre-school. International Journal of Child-Computer Interaction, 6, 39–48.

[5] Cottam, M., & Wray, K. (2009). Sketching tangible interfaces: Creating an electronic palette for the design community. IEEE Computer Graphics and Applications, 29(3), 90–95.

CONTACTS
hugojrlopes@gmail.com
vcarvalho@ipca.pt
cristina.sylla@gmail.com