Narration Accessibility Feature – a Screen Reader Simulator for Unity Applications

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Introduction

- Accessibility is becoming an increasingly relevant issue that is evident from the various Web accessibility regulations around the world [1].
- Although screen readers are a technology that has long been integrated into most widely used operating systems (e.g., Android, iOS), their compatibility with game engines such as Unity has not yet been fully achieved.

Description of the research problem

- Enabling screen reader on a device may cause a game developed in Unity to be non-interactive (e.g., buttons cannot be pressed in the startup scene).
- The UAP plugin shows issues incompatibility with new iOS versions, it is yet to be tested with newer Android versions [2].
- Challenge: interfacing with accessibility APIs at the OS level as OS updates are being released monthly.
- The UAP plugin offers compatibility only with the operating system's screen reader which has no support for Croatian language.

Narration: a screen reader simulator

- The Narration feature was implemented in a serious game called The Encounter (Fig. 1.) [3].
- It works on desktop (web version) and on Android and iOS devices and is not affected by OS updates since it is a Unity component (no interfacing with APIs at the OS level).
- It uses interactions screen reader users are familiar with, a single click/tap for moving to the next UI element (which is also read aloud) and a double click/tap to select the current element (Fig. 2.)
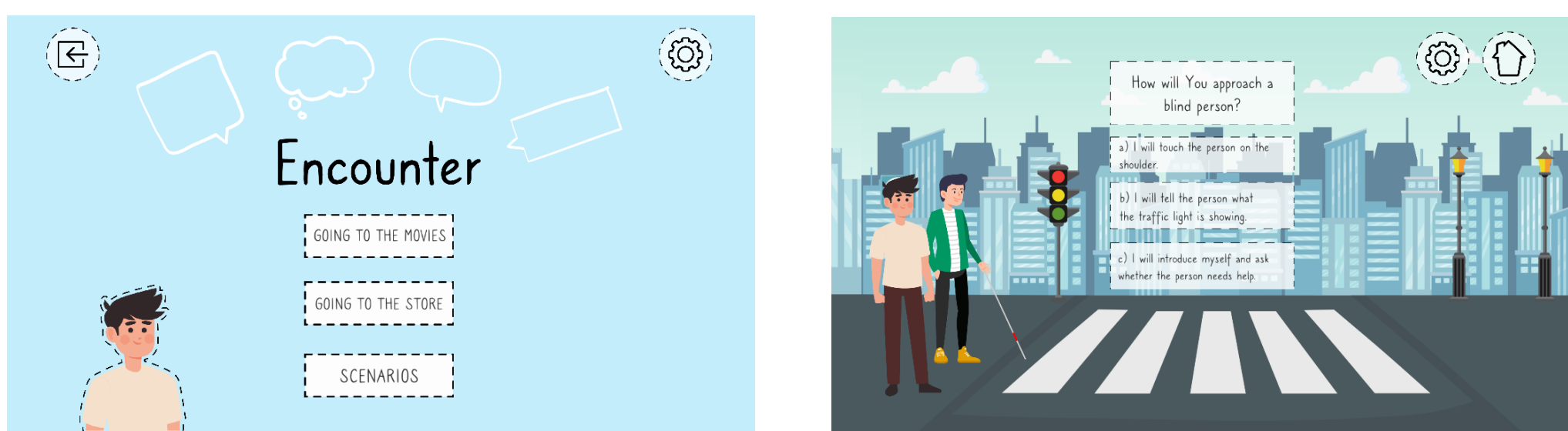

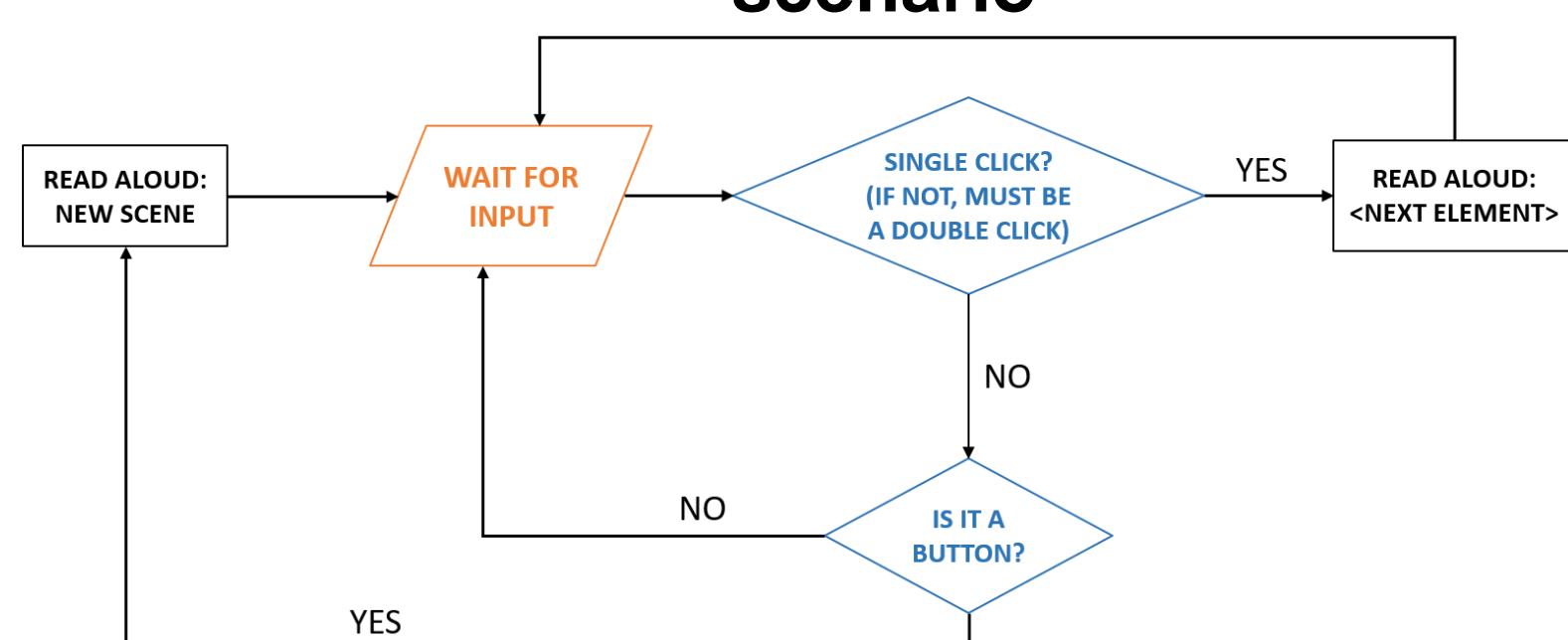**Fig. 1. The Encounter application main screen and the first scenario**

Fig. 2. High level narration flow diagram

Evaluation results

- 2 iterations of user evaluation (214 participants)
- User evaluation process:

  1) Test the built-in screen reader on mobile devices (*VoiceOver* or *TalkBack*) to get familiarized with possible interactions when using a screen reader
  2) Test the narration feature in the Encounter application
  3) Answer the questions in a survey

- Results show that most participants consider the narration feature intuitive (~81%, Fig. 3. (a)) as well as order of element reading (~97%, Fig. 3. (b))
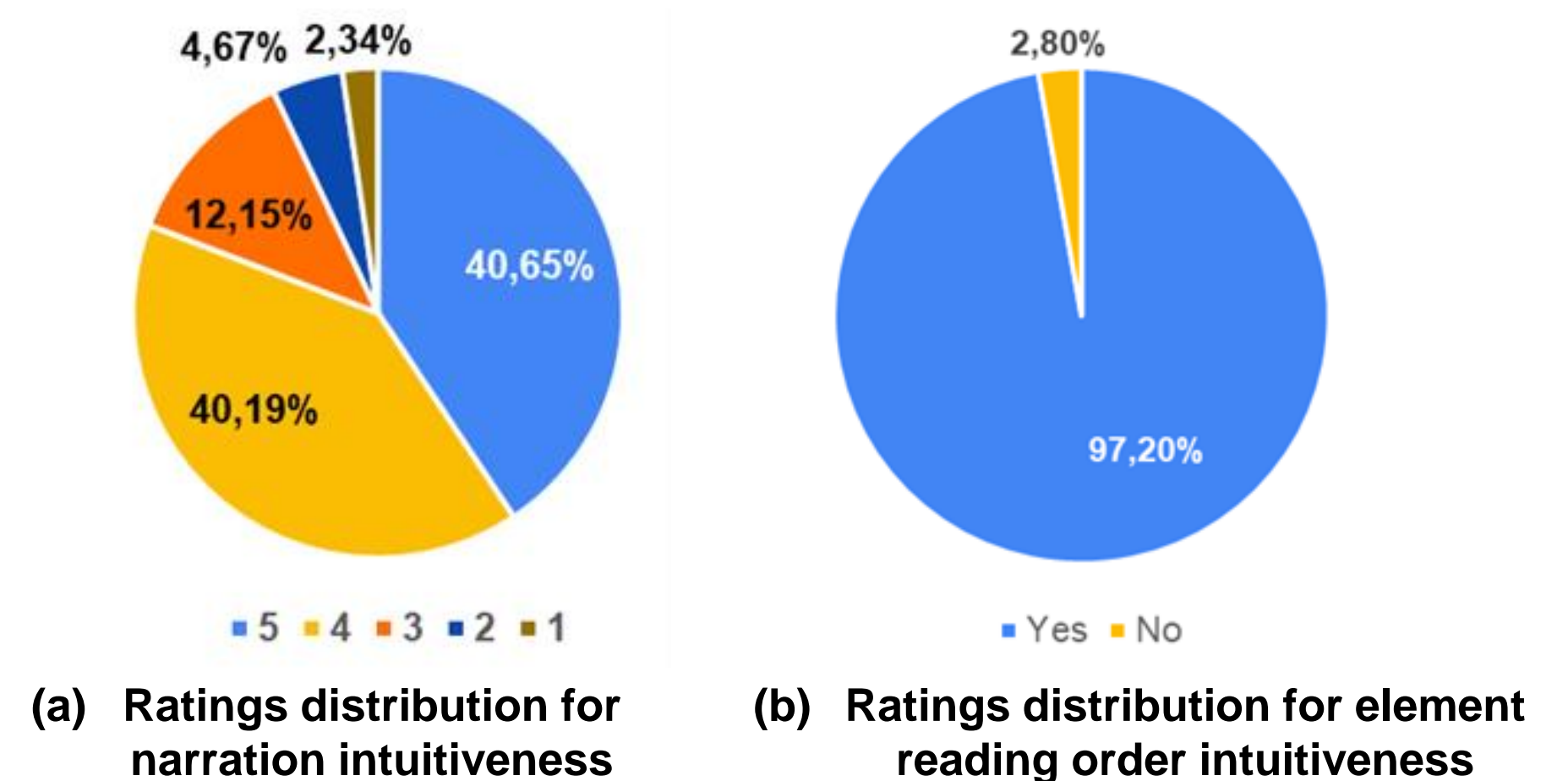

(a) Ratings distribution for narration intuitiveness

(b) Ratings distribution for element reading order intuitiveness

Fig. 3. Pie charts showing the evaluation results

- Evaluation is performed with the blind person who is experienced in screen reader usage
- Additional suggestion for narration feature improvement: allow movement within the application in the opposite direction

Conclusion

- The solution described in this paper can be implemented in any other application developed with Unity that includes a user interface
- Narration flow is an innovative feature that is unique for Croatia, especially since there are no official free text-to-speech tools for Croatian visually impaired users.
- Narration was tested with over two hundred students who already had experience with screen readers and, as well as with a blind screen reader user
- Further improvements and validation testing with more visually impaired users are planned for the future.

References

[1] W3C WAI, "Web Accessibility Laws & Policies," Jan. 2019. [Online].Available: https://www.w3.org/WAI/policies/

[2] MetalPopGames,"UIAccessibilityPlugin(UAP)."[Online].Available: https://assetstore.unity.com/packages/tools/gui/ui-accessibility-plugin-uap-87935

[3] Topolovac, I. Rasan, Z. Car, and I. Majerski, "Collaborative Frameworkfor Implementation of Accessible Digital Solutions," inAgents and Multi-Agent Systems: Technologies and Applications 2021, 2021, pp. 53–63.