Active Tangibles for Tabletop Interaction based on the Kniwwelino Prototyping Platform

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OBJECTIVES

• Presenting the design and implementation of an affordable (~$30) and easy-to-use prototype of an active tangible based on a microcontroller-based development platform called Kniwwelino.

• Exploring the feasibility of active tangibles in a tabletop problem-solving scenario.

COMPONENTS

• Kniwwelino board with a 5 × 5 LED matrix, an RGB LED and two push buttons. Sensors and other peripherals can be connected by additional ports.

• WiFi stack to connect the Kniwwelino board to other boards or to a tabletop application over the internet, making use of MQTT as standard IoT message protocols.

• WS2812 RGB LED ring.

• Vibration motor

• Wemos Buzzer

• Shield and two servo motors.

• Wireless charger according to the Qi standard

• Li-ion battery

• Charging circuit.

FEASIBILITY TESTING

• We tested the feasibility and acceptance of the Kniwwelino active tangible in the context of a problem-solving tabletop application developed in JAVA using TULIP. The basic idea is to provide participants with the opportunity to collaboratively succeed subtasks and through this approach, develop and refine their collaboration strategies.

• The main shared space is designed as a 9 × 11 grid in which the participants have to steer a planetary rover to collect minerals in the grid. Participants need to discuss which items to target and which route to take while considering their movement limitations and energy level and avoiding the obstacles.

• When starting a level, some of the items (minerals, sharp rocks and refill stations) are hidden and participants need to search the grid to reveal them.

• The active tangible is a radar drone that enables participants to get some clues on the location of the hidden items; once the participants put the tangible on the grid, a border covering nine cells appears around the tangible. The integrated matrix display shows the total number of items hidden within this quadrant; Pressing the button of the tangible reveals the hidden items.

• The use case demonstrates the technical feasibility of our solution as well as the applicability of the design for tabletop applications.

REFERENCES

• 3D model of the active tangible: https://www.thingiverse.com/thing:3780938

