Supporting Older Adults in Using Complex User Interfaces with Augmented Reality

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INTRODUCTION

Using complex interfaces has been shown to be challenging for older adults. Existing tutorial systems can be cumbersome, and sometimes difficult to use. To solve this problem, we present a system to support older adults in using visual interfaces by providing step-by-step visual guidance with augmented reality. Using the Apple ARKit platform, our system detects the interface in a phone camera view, and provides visual guidance for users to access the interface following a generated sequence of interactions based on pre-specified tasks and prior knowledge of the interface.

IMPLEMENTATION

Pre-Loading Action Sequence

Knowledge of existing interfaces can be provided by manufacturers, or extracted by analyzing point-of-view videos through a crowd-computer vision pipeline. Either way, a *state diagram* containing potential action sequences can be generated.

Recognizing User Interaction

The system recognizes user interactions by matching the current phone camera view with reference images using the Apple ARKit. Thus, the system identifies the current state of the interface and thus knows the user's progress in the action sequence.

Providing Guidance to Complete Task

Based on prior knowledge and current state of the interface, the system displays visual indicators on top of the interface in the AR scene to guide users to complete the task.

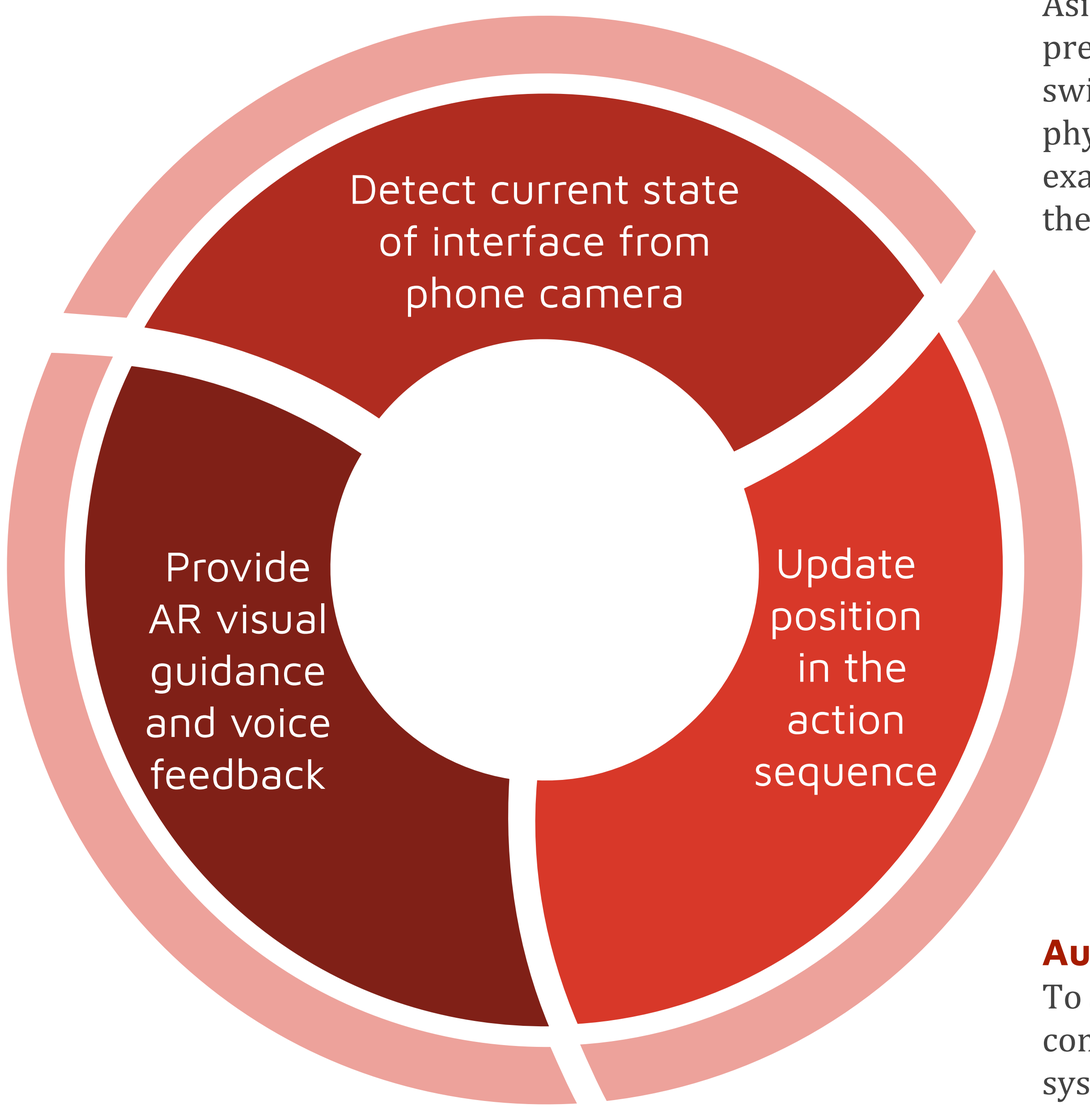

Figure 1: System workflow

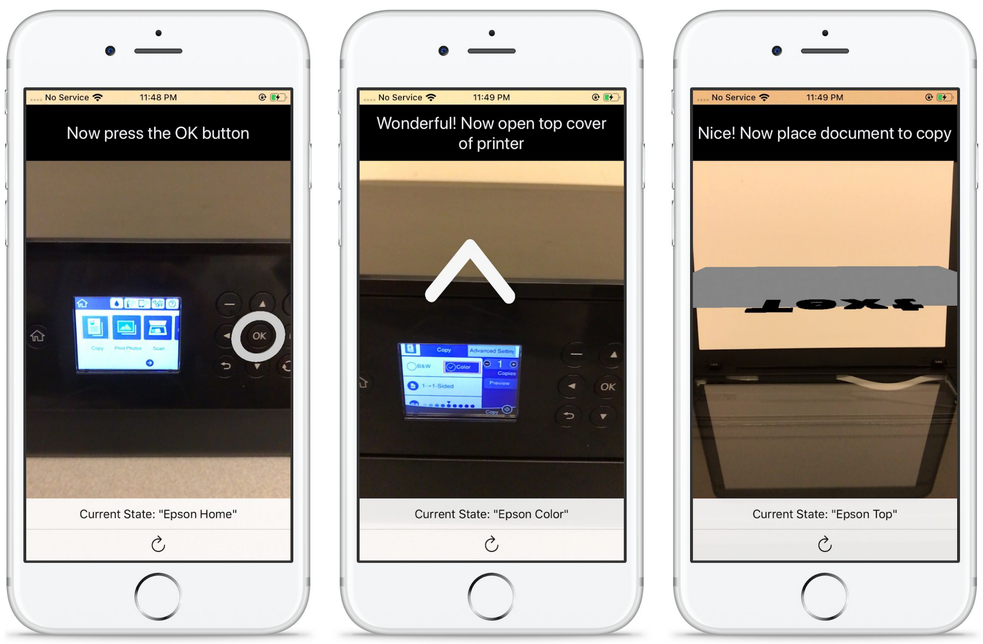

Figure 2: Example Screenshots

REFINEMENTS AND MULTI-MODAL GUIDANCE

We conducted preliminary user testing on the system, and refined the system design based on user feedback and observations. Some major improvements included refining AR visual indicators, adding camera aiming support, adding text display of instructions on screen, and adding audio feedback.

AR Visual Indicators

Aside from animated circles around buttons to press and arrows indicating gestures such as swiping, we added more 3D indicators of physical objects users might interact with, for example, a 3D object in the AR scene indicating the document to copy with the printer.

Camera Aiming Support

As the visual indicators in the AR scene might be out of the camera view, we added voice instructions for users to move phone camera, e.g. move to the right if the visual indicator is to the right of the camera view, making visual guidance easier to follow.

Text Display and Providing Rapport

As understanding shapes and icons themselves might still remain a challenge for some users, we added text display of instructions. We also added encouraging feedback at each step to provide rapport for users during the process.

Audio Feedback

To avoid confusing users with too much visual components, we added audio feedback into the system, including announcing the text instruction displayed on the screen and providing a beeping sound whenever a state change is detected.

FUTURE WORK

We will explore ways to refine the system design and improve the accuracy in identifying user interactions, potentially by capturing non-visual feedback from interfaces such as beeping and by incorporating hand detection to track finger location and thus infer performed interaction. To improve usability, we will further iterate on the visual and voice guidance to make them more intuitive and easily understandable for older adults. We also plan to conduct user testing with older adults to understand the effectiveness and performance of our system over traditional approaches such as tutorial manuals.

EXAMPLE ACTION SEQUENCE

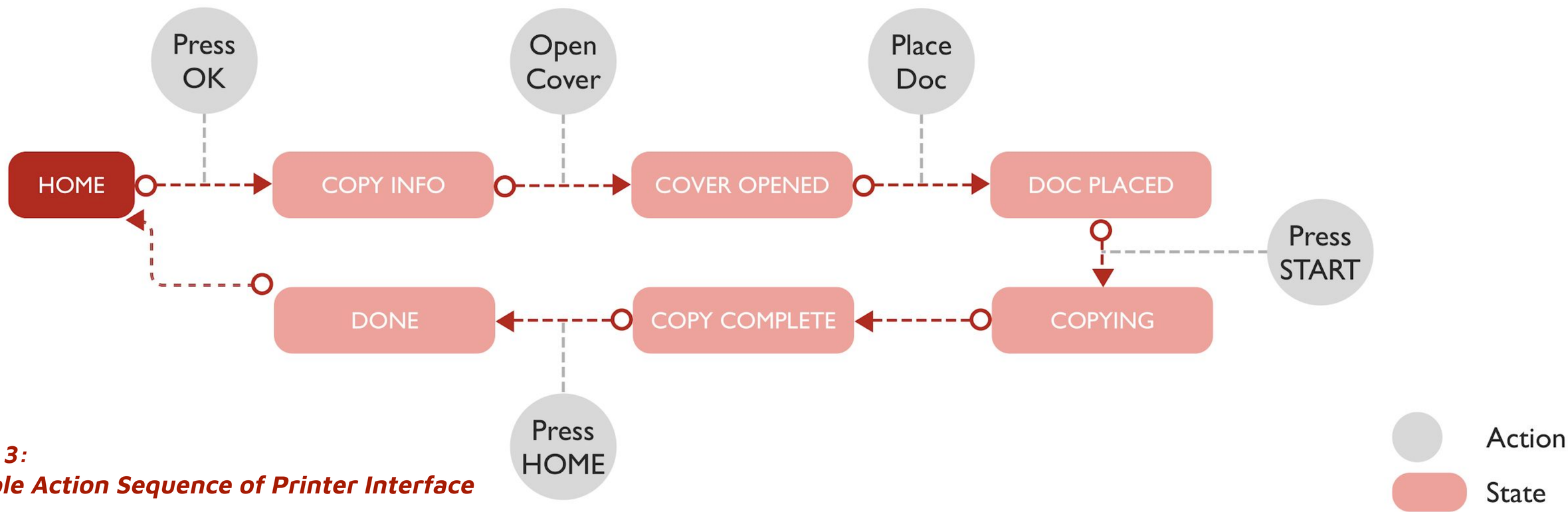

Figure 3: Example Action Sequence of Printer Interface