Exploring Scaffolding Techniques for Agent-administered Brief Cognitive Screening in Hospital Settings

Dingdong Liu[1], Sensen Gao[2], Zixin Chen[1], Yifan Shen[1], Chuhan Shi[3], Bertram E. Shi[1], Xiaojuan Ma[1]
[1]The Hong Kong University of Science and Technology, China
[2]Nankai University, China
[3]Southeast University, China

Looking for collaborations

Full Paper
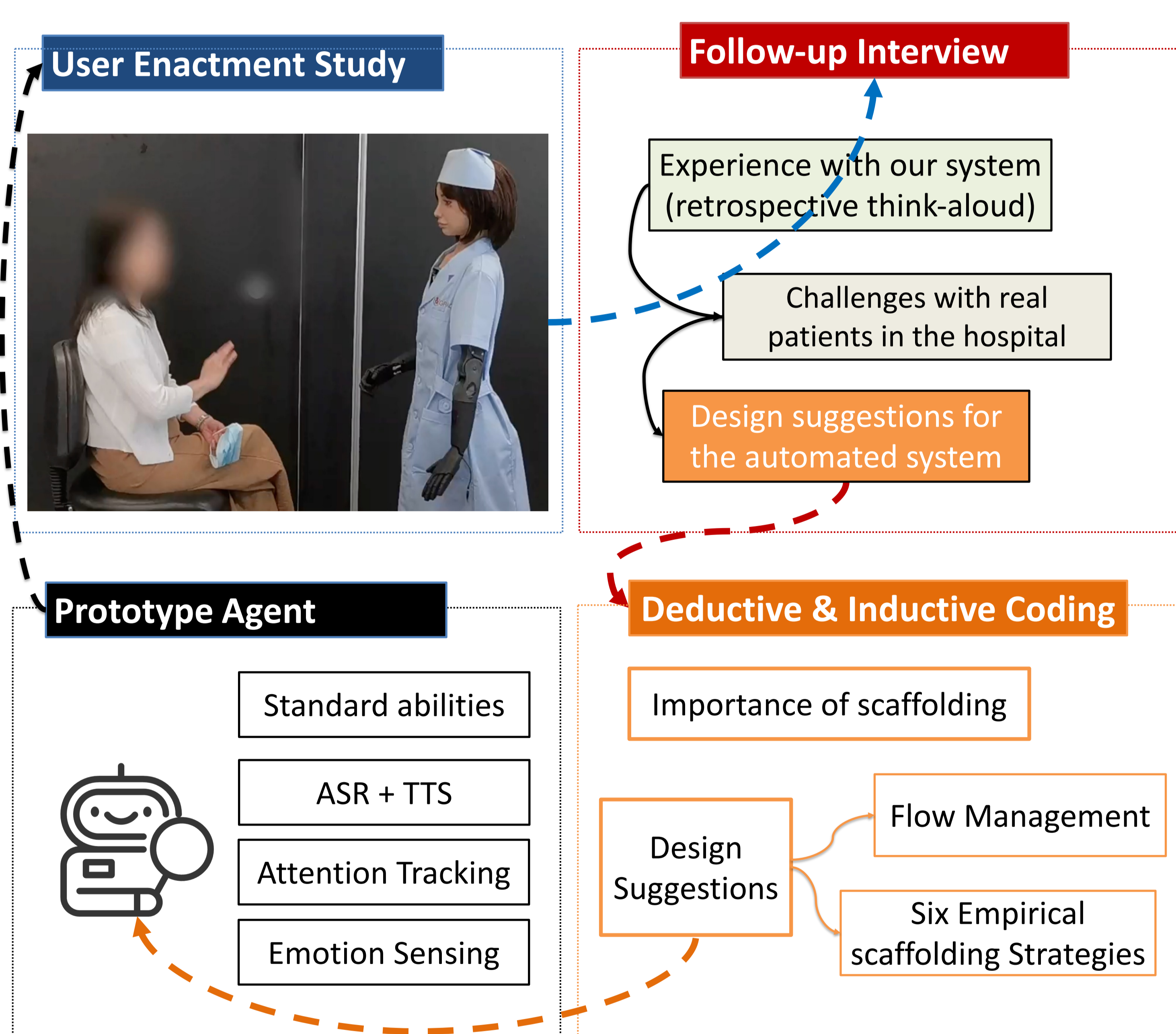
Motivation

- **Urgency of Efficient Screening**: Cognitive screening is essential for early detection of impairments in older adults, but manual tests like AMT and MMSE are time-intensive and clinician-dependent.
- **Clinician Burden**: High screening volumes lead to clinician fatigue and burnout, impacting care quality and causing delays in diagnosis and treatment.
- **Advantages of Conversational Agents**: These agents offer potential in scalability and consistency but need adaptation to meet the specific support requirements of cognitively impaired patients.
- **Communication Challenges**: Patients with cognitive decline require tailored communication aids such as metaphors and reminders to ensure effective screening – these strategies are called "scaffolding".
- **Scaffolding Strategy Needs**: Current scaffolding techniques are not fully explored for cognitive screening in older adults, necessitating research to optimize patient guidance without compromising test integrity.
- **Research Goal**: This study aims to identify effective scaffolding strategies used by clinicians to inform the design of conversational agents, enhancing screening efficiency and reducing clinician workload.

Method

User Enactment Study

Follow-up Interview
- Experience with our system (retrospective think-aloud)
- Challenges with real patients in the hospital
- Design suggestions for the automated system

Prototype Agent
- Standard abilities
- ASR + TTS
- Attention Tracking
- Emotion Sensing

Deductive & Inductive Coding
- Importance of scaffolding
- Design Suggestions
  - Flow Management
  - Six Empirical scaffolding Strategies

Findings: Purpose of Scaffolding

- **Standardization vs. Support**: Although the AMT test should be given without altering questions, clinicians often need to scaffold to help patients understand and respond.
- **Encouraging Participation**: Clinicians guide patients subtly to encourage effective use of their knowledge without giving direct answers. Scaffolding is crucial for patients who frequently say, "I don't know," aiming to motivate them to engage and attempt answers.
- **Balancing Act**: The challenge is to provide sufficient support without compromising the standardized nature of the test, ensuring accurate assessments.

> "I will give some kind of … not hint, but to guide the patients to tell me what they know."

> "… the purpose (of scaffolding) is to encourage the patient to try their best."

Findings: Six Scaffolding Strategies

What are these strategies?
- **Follow-up Question**: Clinicians ask additional questions to help patients elaborate or clarify their initial responses.
- **Give Hints**: Hints are provided to assist patients in completing or correcting their partial or imprecise answers.
- **Ask to Think Again**: Patients are encouraged to reconsider their answers to enhance accuracy and depth of response.
- **Ask for a Guess**: When patients struggle, they are prompted to guess, providing useful data on their cognitive abilities.
- **Change Wording**: If a patient misunderstands a question, the wording is modified to improve comprehension.
- **Simplify Question**: Questions are simplified or rephrased to accommodate multiple acceptable answers, making it easier for patients to respond.

Scaffolding Strategies	Examples	Scenarios	Frequency Case 1	Case 2
Follow-up question	(when the patient only gives the time) need to check further if it is AM/PM	11	5/26	9/26
Give hints	"Look outside the window, is it night or morning now?"	7	7/26	1/26
Ask to think again	"If she said she is in her 50s (which is wrong), then I ask her to think again."	5	7/26	2/26
Ask for a guess	(after several failures or "I don't know") "Then I'll ask him/her to try to guess."	5	11/26	0/26
Change wording	"Change the wording when repeating questions (to ensure understanding)"	2	8/26	0/26
Simplify question	I will ask in approximate - are you in your 80s or 60s - if patient cannot remember exact age.	2	5/26	2/26

How to use these strategies?
- Scaffold questions upon patient based on user's answers.
- Approximate answers or partially correct answers: ask follow-up or further questions, give hints, or ask the patient to think again.
- Cannot answer the questions: Consider if the patient understands the question and will try to change the wording; ask the patient to give a simplified answer (some questions in the AMT test accept multiple answers); make a guess when the patient cannot answer after several tries.

Findings: Task Flow Management

- **Test Flow Maintenance**: Emphasize quick progression to prevent loss of patient attention and confidence.
- **Give Positive Feedback**: Use phrases like "good job" to keep patients motivated and engaged.
- **Confirm Understanding**: Repeat questions to ensure patients are focused and not stuck on previous queries.
- **Skip and Return**: Temporarily bypass difficult questions and revisit them later if sequence allows.
- **Manage Non-cooperation**: If patients refuse
- to cooperate, have the robot disengage and alert nursing staff.

Avoid discouraging the patients

Takeaways

1 Support patient with scaffolding strategies: Clinicians use various scaffolding strategies to support patients. They provide help but avoid compromising the standardized nature of the test, ensuring accurate assessments.

2 Choose appropriate strategies according to patient answers: approximate or partial answers; incorrect answers triggers different set of strategies.

3 Balancing Scaffolding and Test Flow: While scaffolding aids in cognitive screening, excessive use can distract or annoy patients. It's crucial to adjust the degree of scaffolding based on the patient's emotional state to maintain test flow.

Future work may consider incorporating real patients to provide deeper insights and validate the effectiveness of the conversational agents