

GUI Meets VUI: Some Possible Guidelines

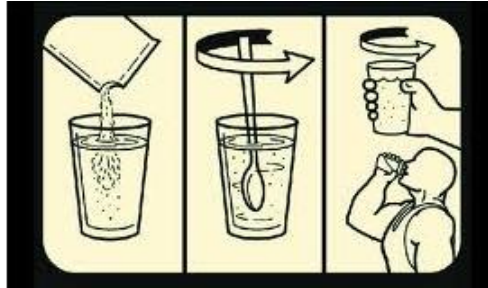
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Situations Where Display Technology Is Useful

$$\begin{aligned}
 \int e^{4x} \cos 5x \, dx &= \operatorname{Re} \left[\int e^{4x} (\cos 5x + i \sin 5x) dx \right] \\
 &= \operatorname{Re} \left[\int e^{(4+5i)x} dx \right] \\
 &= \operatorname{Re} \left[\frac{1}{4+5i} e^{(4+5i)x} + c \right] \\
 &= \operatorname{Re} \left[\frac{4-5i}{41} e^{4x} (\cos 5x + i \sin 5x) + c \right] \\
 &= \operatorname{Re} \left[\frac{(4-5i)(\cos 5x + i \sin 5x)}{41} e^{4x} + c \right] \\
 &= \operatorname{Re} \left[\frac{(4 \cos 5x + 5 \sin 5x) + (4 \sin 5x - 5 \cos 5x)i}{41} e^{4x} + c \right] \\
 &= \frac{4 \cos 5x + 5 \sin 5x}{41} e^{4x} + c
 \end{aligned}$$



Situations Where Speech Technology Is Useful



Combine GUI and VUI

- Leverage advantages of GUI and VUI
 - GUI
 - Extend user memory
 - Look and manipulate
 - Personalize display arrangement
 - Speech
 - Annotate, narrate, and dictate
 - Present errors and notification
 - Formulate complex queries and requests
- Enable user to switch between GUI and VUI easily and naturally

11 Guidelines for Multimodal User Interfaces

- 1. Enable Users to Choose Mode
- 2. Make Presentation Reactive
- 3. Minimize Cognitive Processing
- 4. Use Voice Assistance
- 5. Use Multifactor Speaker Identification and Verification
- 6. Use Voice in Emergencies
- 7. Use Voice When Hands, Eyes Busy
- 8. Leverage of User Emotion
- 9. Integrate Voice and Gestures
- 10. Inform User When to Speak
- 11. Involve Users at Every Stage

1a. Enable User to Choose Input Mode



Click or speak

Swipe, touch, or speak

Type or touch



1b. Enable User to Choose Output Mode

- For privacy,
 - Turn off voice output
 - Route graphical output to a personal display
 - Present result “availability,” but save content for later

2. Make Presentation “Reactive”



Now is the time for all
good men to come to the
aid of their country

A speech bubble with a black border and a white background. The text inside is the full sentence: "Now is the time for all good men to come to the aid of their country".

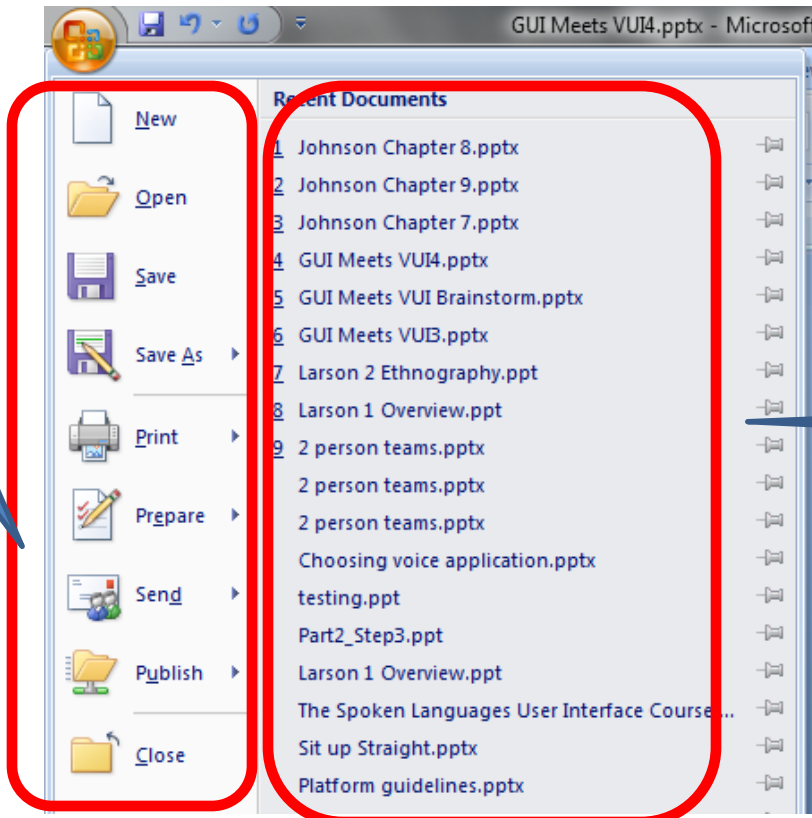
3. Minimize Cognitive Processing

Select Rather than Recall

amazon.com



Possible actions



Task status

Objects



4. Use Voice Assistance

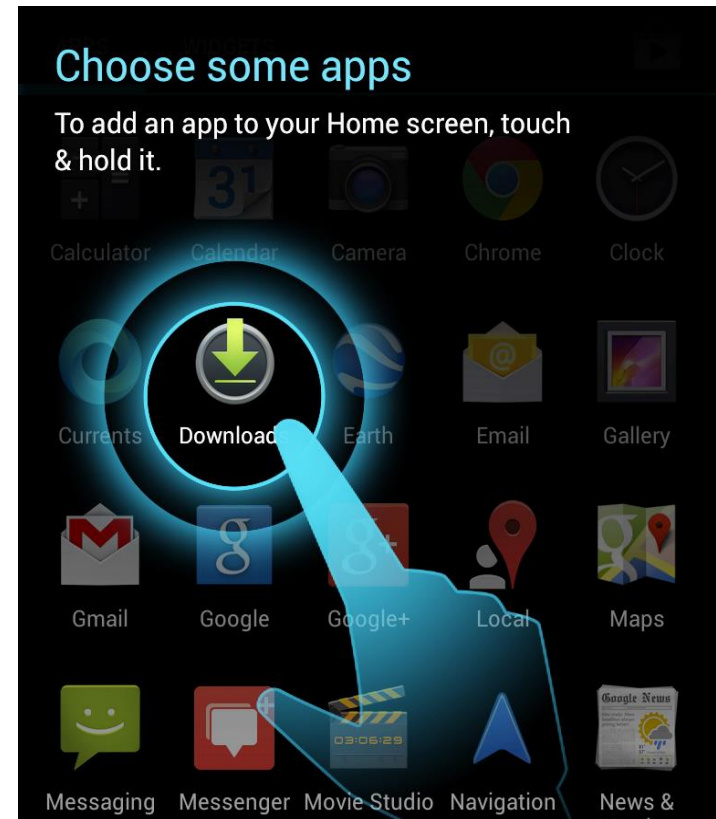
To add an app to your home screen, touch, and hold "Download"

Voice Control of Video



Stop, replay previous 10 seconds

Voice-Over Narration for Help Animation



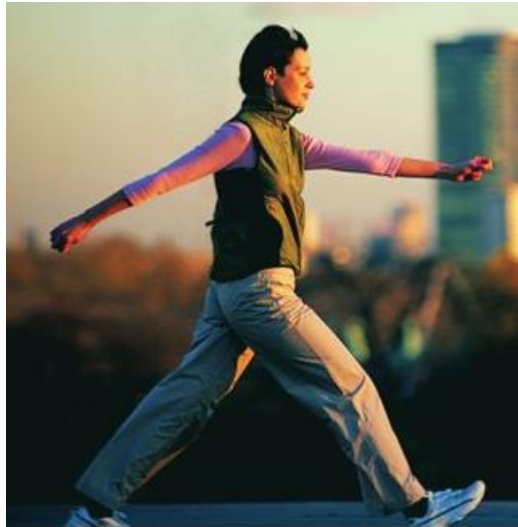
5. Use Multifactor Speaker Identification and Verification



6. Use Voice in Emergencies



7. Use Voice When Hands or Eyes Busy

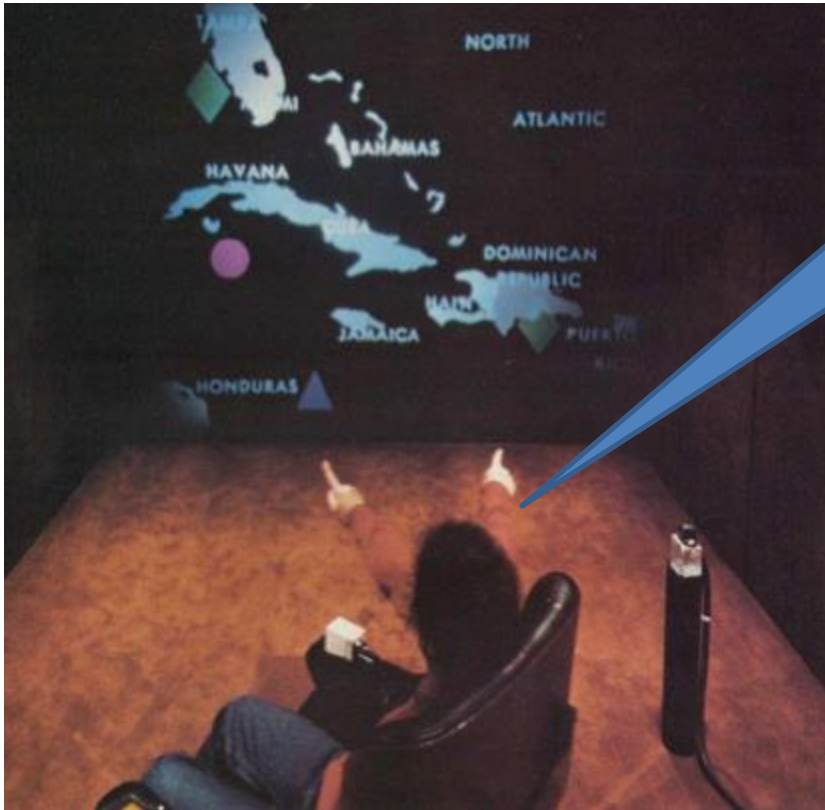


8. Leverage User Emotion

- Detect user emotion
 - Emotion detection from word choice
 - Emotion detection from voice properties
- Convey emotion to user
 - Use expressive voices
 - Emotion effects program logic



9. Integrate Voice and Gestures

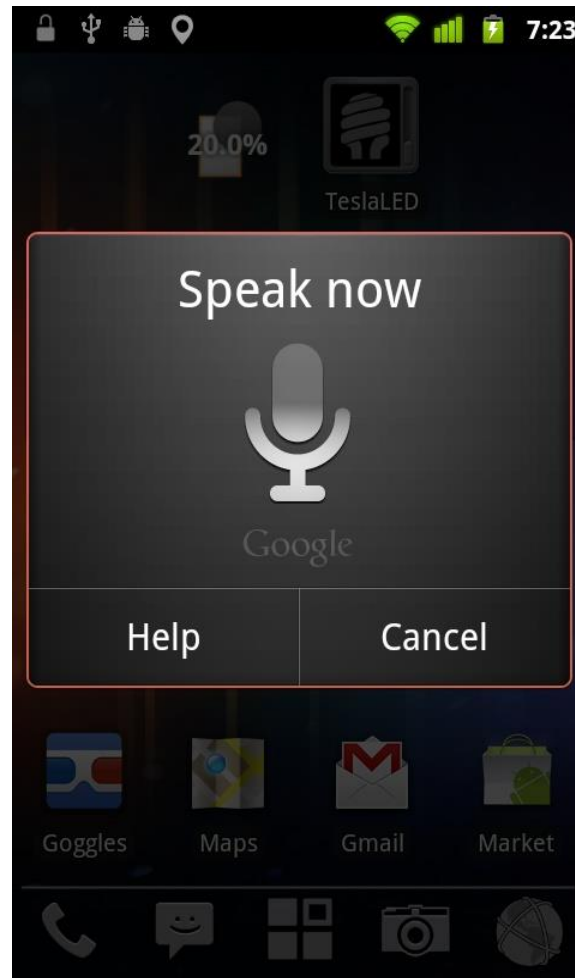


Put
that
there.

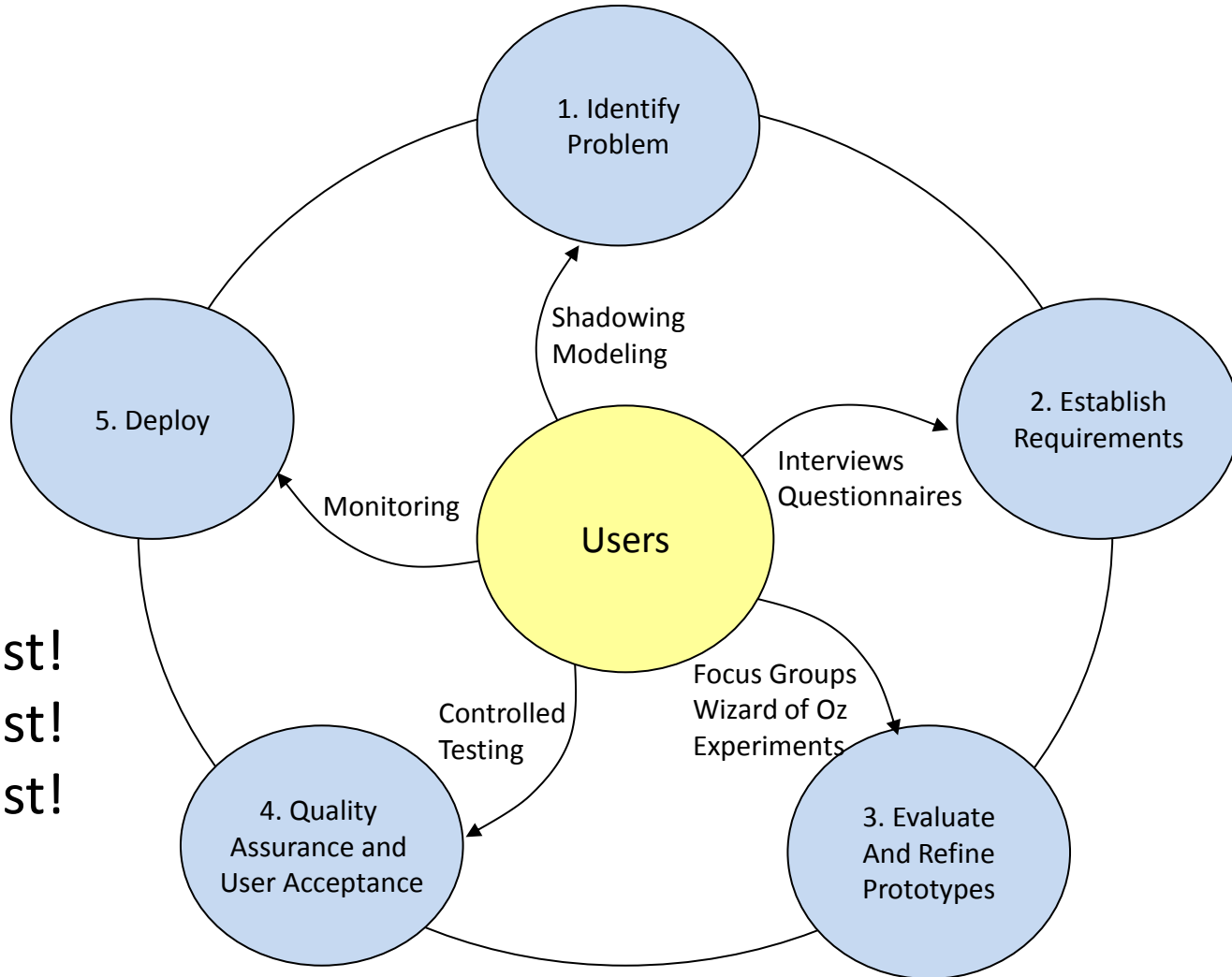
Red.
Green.
Blue.



10. Inform User When to Speak



11. Involve Users at Every Stage



User test!
User test!
User test!

Summary

- Combining GUI and VUI presents challenges
 - Coordinate voice and gesture input
 - Determine whether to speak or display
- Combining GUI and VUI has benefits
 - Leverage advantages of both GUI and VUI
 - User convenience
- Plan and develop carefully
 - User test, test, and test some more

Questions

