

CSE 403

Requirements: Car remote exercise

Exercise

- Remote with 3 buttons (B1, B2, B3)
- Car detects press at 30 yards
- Car detects remote within 4 feet
- Keyless ignition system



The problem (assignment)

- Define requirements for
 - Locking the doors
 - Unlocking the doors
 - Opening the trunk
- Specify four additional features

Lock, unlock, trunk

- Click B1: Lock all doors, hazard lights flash twice
- Click B2: Unlock driver's side door
- Double click B2: Unlock all doors
- Hold B2: Pops trunk (if car is in park mode)

Security

- Hold B3 for 1 second: Sound horn, flash lights AND sets warning_state = on
- Triple click B3: if (warning_state == on) { stop horn and flashing; warning_state = false }
- If key is further than 4 feet from car AND car engine is on { lights flash AND horn sounds } // warns driver when walking away from running car

Seat configuration

- Holding B1 and clicking B3: record current driver/seat/mirror configuration as “C1”, car beeps once
- Holding B2 and clicking B3: record current driver/seat/mirror configuration as “C2”, car beeps twice
- Single clicking B3 adjust driver's seat configuration to config 1 (only works when car is not running)
- Double clicking B3 adjust driver's seat configuration to config 2 (only works when car is not running)

Notes

- Click == depress and release button in .1 sec (double click == clicking twice, triple click == clicking 3 times)
- Operation range: 20' distance seems too restrictive for detecting button actions. If the car can receive the signal, it should work
- Hints: button 1 is about unlocking/opening, button 2 is about locking/closing, button 3 is for special functions
- Issues:
 - Adjusting to a seat configuration is hazardous to a tall person if a configuration is for a small person. (Also, should seats adjust if warning_state == on?)
 - Is clicks of .1 sec correct? Is holding 1 second the right amount to set of security warning?
 - Accidental B3 clicks?

Comments

- “Simultaneously pressing all three buttons...”
- Pressing BI locks doors when unlocked, unlocks doors when locked. Horn and lights flash when BI is pressed
- Horn sounds vs. flashing lights
- Missing feature: Unlocking just the driver’s door?
- Continuously pressing a button causes....
- If the key is not within 4 feet, the car will not start. If it’s running, it will stop, lock the steering wheel, and lock the doors.
- If the remote is running out of battery and the car is within 4 feet, it will send a signal to the car to show a low-battery message.

More comments

- The remote has an alarm and vibration function which will be triggered if the car is broken into, or moved forcefully.
- Ability to pop trunk with B3; Alternatively start car with B3
- Alarm Auto-off: When the user is close to the vehicle, the alarm will disengage.
- To remote start: press and hold B3 for a full second to start the engine and turn on the headlights. After two minutes it will turn off unless it detects the remote within 4 feet of the car. If anyone tries to put the car in gear or touches the brakes/gas the engine will shut off if the remote is not detected.

More comments

- Doors automatically unlock when key is near; car enters unlocked state
- Door automatically locks when key is beyond 4 feet
- Car automatically shuts off if key is beyond 4 feet

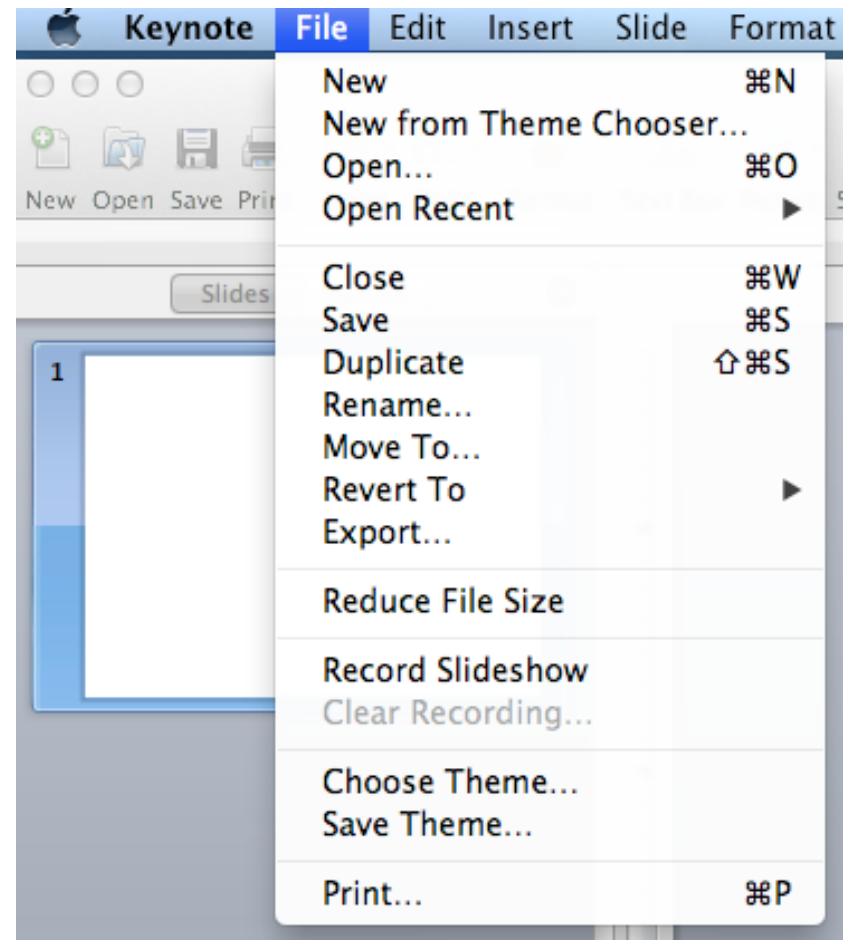
Do we know when a key enters within 4 feet, is within 4 feet, leaves 4 feet, or is further than 4 feet?

Still more comments

- What happens when there are two remotes? Interaction with the automatic features? (Automatically lock the doors when key is more than 4 feet away)
- Keyless start, remote start, and distance sensing seem more problematic because they are new/novel features
- Unintended **feature interactions** (e.g. remote start and engine shut down or warning when key not near car)

Feature interaction problem

- Mac OS X (as of “Lion”) autosaves files and creates recoverable versions
- Explicit saves no longer needed!
Can find history of older versions (Sounds good!)
- However, what happens if you want to discard your current changes? (You now need to explicitly revert to set the current version to the last change)



Feature interaction problem

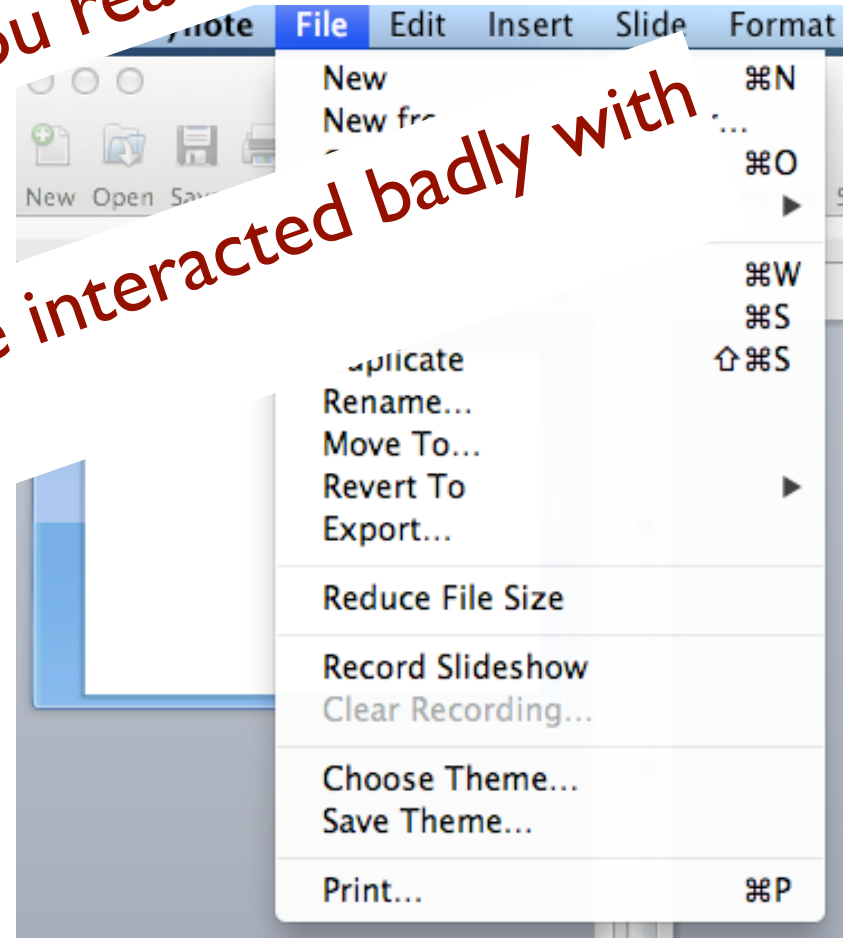
- What gets saved when you close the application? program creation

• What is the point of “Save?”
• When do you use it?

- What happens when you use “Move To?”
• Does it save the name of all the files too? What about “Move To?”

Probably all make sense if you read the “manual”

But the new autosave interacted badly with existing features!



Conclusions

- Requirements are hard
- The details matter
- How specific do we need to be? Are use cases necessary?
- Be careful about feature interactions
- It's hard to tell if we've specified good requirements, unless we dig deep
- Most solutions met “the letter of the assignment” but had problems at a deep level