Submission 2 - Smart lock

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1.1 Need Statement

There is a need for a lock and key system that can notify users if they forget their key and deactivate if the key is lost or stolen. This would improve security and convenience by preventing unauthorized access and alerting users in real time.

1.2 Brainstorming

1.2.1 Adam Wu

- As a person who has amnesia, I would like to be able to find my keys anytime so that when I forget where I place them, I can find them.
  - Having a "find my" solution with a key.
- As a person who loves security, I would like to have the best lock for my house so that lock pickers are not able to pick my lock.
  - Making an "authentication" key that resets the key code within a set time, making it harder for hackers to unlock the door.
- As a person who is always last-minute out the door, I fear forgetting to lock the door when I close it.
  - Auto-locking door when a person closes the door.
- As a person who often forgets to bring their keys, I am scared of getting locked out.
  - Having a notification from the key to the phone that alerts: "keys are not close by to you."
- As a parent, I am scared of my kids forgetting their keys and locking themselves out of their room.
  - Creating a "master key" that only parents/admins can use to unlock specific doors.
- Concerned about key battery life.
  - Send a notification to the user when the key is on low battery.

1.2.2 Nathaniel Laurente

- Key has the ability to notify the user when too far away from the user's phone/body.
- Key deactivates/won't be able to open the door if too far away from the owner.
- "Tap to Pay" technology concept.
  - Unlocks the door like a credit card tap on a phone.
  - If too complex, explore alternative ways to unlock the door.
  - Eliminates the need for a physical key.
  - Prevents stolen keys from working if the user still has their phone.
- Secure deactivation of the key when too far from the user.
  - Possible solution: Use the user's phone for deactivation.
- One-time password generator between lock and key to ensure only this exact key can enter the house.
- Backup way to get into the house if the user forgets/loses their key.
  - Pin access code.
  - App allows for 2FA authentication using a thumbprint and/or Face ID.
- Will the battery last long enough for multiple years?

1.2.3 Neena Nguyen

- Existing smart lock solutions:
  - Smart locks for dorm rooms using mobile apps, passcodes, and scanners.
- Who will use this lock?
  - People with memory issues (elderly, ADHD).
  - University students in dorm rooms.
  - Student ID scanner integration.
  - Parents with small children (child-proof locks).
- Features for parental control.
  - Locks after a curfew time.
  - Prevents children from unlocking without parental approval.
  - Alerts parents when kids come home from school.

- What kind of door lock will it be?
  - Facial recognition (requires camera and database knowledge).
  - Logs entry and exit timestamps.
  - Digital passcode through an app.
  - Auto-relocking mechanism after failed attempts.
  - Bluetooth detection for unlocking within a certain range.
  - Dual authentication (PIN + scan).
  - Optional security trigger after specific hours.
  - Alerts when the door is left unlocked for too long.
  - Auto-locking after prolonged unlocking.
  - Detection system to check if the key is on the person.
  - Prevents intruders from entering without a key.

1.2.4 Jackson Kennedy

- Normal keys can be lock-picked, but digital keys can be secured based on a communication protocol.
- Secure authentication methods.
  - PIN authentication with 2FA.
  - Optimal PIN length (e.g., 4-digit PIN has 1,048,576 combinations).
  - Brute force prevention strategies.
- Preventing communication protocol vulnerabilities.
  - What protocol should be used? (Bluetooth has vulnerabilities and short range.)
  - Cloud-based solutions rely on third-party vendor security.
  - What information needs to be transferred? (Video data, authentication signals?)
- Lock activation logic.
  - How exactly will the lock know when to unlock? (Sending a 0 or 1 signal based on specific conditions?)
- Security and alerting technologies.
  - Sensors to detect nearby people.
  - Hidden camera or biometric verification for identity confirmation.
- Scheduling and timed access.
  - Physical locks do not have scheduling options.
  - Implement timed unlocking (e.g., unlock for 15 minutes for a babysitter).
  - Extra verification to prevent intruders from exploiting schedules.