

Zippo Lighter

Problem Statement

Making child-safe lighters that are easy for adults to use and yet interactive for children is a tall order. Instead of merely instructing children to stay far away from lighters, our method of making it child-safe allows the child to get close to the lighter and play around with it.

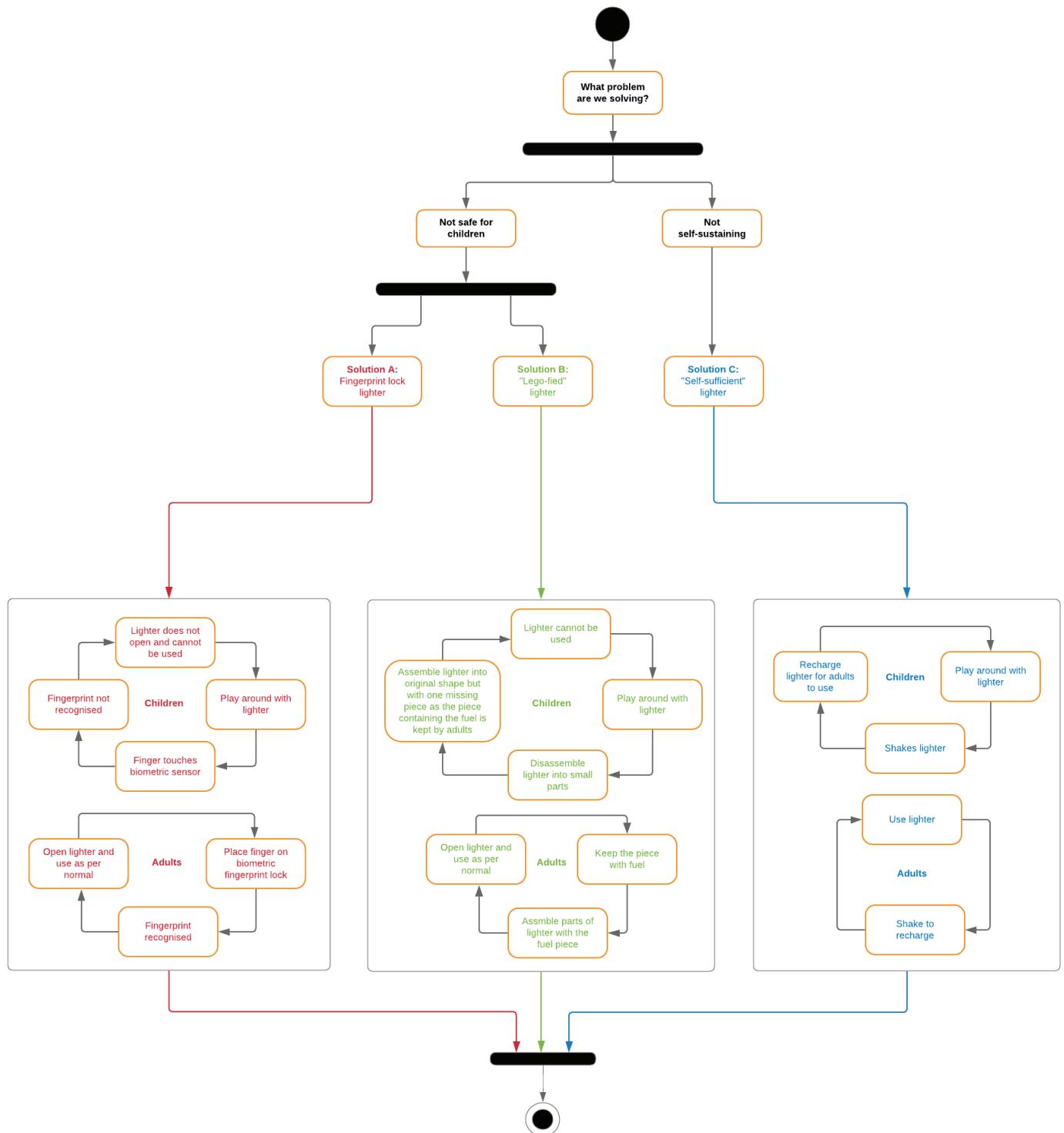
Firstly, we came up with a lighter that has a fingerprint lock on it. This only allows adults who have registered their fingerprints to use the lighter, whereas children who play with the lighter will not be able to operate the lighter. To refine this solution and make it more interactive, we are planning to include an element of sound into this prototype, which will indicate whether the scanned fingerprint is correct or not.

Secondly, we came up with a Lego-style dismantlable lighter, with the piece containing the fuel kept by an adult, without which a fire cannot be lighted. To refine this solution, we are planning to reduce the number of pieces that the lighter can be dismantled into to maintain fun for children and usability for adults.

Additionally, reusable lighters currently available in the market require either more fuel or USB chargers to recharge. This is cost-inefficient and inconvenient for lighter users because it always requires users to buy lighter fluid or charge their lighters. Since electricity or lighter fluid is not always available, we came up with a lighter that can be recharged through winding.

However, winding is not a feasible or efficient method to recharge the lighter under normal circumstances since the lighter needs to be wound many times in order to generate enough power to light a fire. Hence, we are also planning to include an option for users to recharge their lighters through USB chargers.

System or Network Drawing



Testing Plan

Hypotheses

TARGET AUDIENCE INTERACTION WITH PROTOTYPE

Lighter that can be broken apart into logo pieces	Biometric lock	Target audience: Children	Users intuitively understand the sounds produced by interacting with the lighter or charge their lighter with successful/failed authentication.	Target audience: People who find it a hassle to refill or charge their lighter using USB chargers.
• Children will be able to safely play with the lighter as a toy after simply taking away the fuel component of the lighter	• Unlock: Touch to unlock and spring loaded cap opens	• Children would sounds produced by interacting with the lighter with successful/failed authentication, to increase the opening and closing safety features of lighters and elements for distraction. An interactive lock would be able to accomplish both purposes.	• These people will have fun "shaking" or "winding" their lighters to recharge their lighters, such that energy will be harvested to light fire	
• The Zippo having been a great fidget toy now has an additional dimension of play with it, being able to dismantle and assemble	Wireless authentication	• When attempting to unlock the lighter, the user's phone must be nearby for authentication		
• When children insist on grabbing on to the lighter and playing with it, adults can allow them to play with it with a peace of mind, with the child learning about the different parts of the lighter				

Features to Test (and why)

FEATURES/DESIGN ASPECTS EXPECTED TO TEST

Lighter broken down into logo pieces: flint wheel, casing, inside fingerprint sensor	FPC1020A - capacitive casing, cover and fuel	3D capacitive lock	Select sounds for authentication	Energy harvesting features
• Enrolling new finger	• Identification and rejection	• Establish a 3-axis arrangement of 3 capacitive plates to serve as a 3D pattern lock. This promotes play due to the interactivity that it has.	• Failed authentication	• Shaking
• Questions to consider:		• Spring loaded cover/lock controlled by servo	• Opening	• Winding
◦ (Durability) How durable are the pieces with constant taking apart and putting together?	◦ (Safety) How safe is it for children?	• Structural strength	◦ Closing	
◦ (Functionality) How well does it work to provide a flame?		• Reliability		
		• Bluetooth/WiFi connectivity	Sound should convey meaning to the user	The shaking/winding feature is the foundation of this "self-sufficient" lighter. It needs to harvest sufficient energy to substitute fuel and allow the lighter to function.
		• Pairing with iOS/Android	• Meaning	
		• Unlocking app	• Emotion of user	
			• Pleasantness	

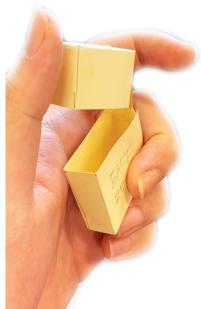
Optional: Sounds to play/music when vibration, drop and child is authenticated

Testing Timeline

NOVEMBER - DECEMBER 2019

T2W9	<ul style="list-style-type: none"> Distribute to users to use Allow them to try out its functionality and try taking them apart and putting it together Interview them about their initial thoughts on interacting with it 	<ul style="list-style-type: none"> Physical casing First demo Round 1 sound Order parts for capacitive plate prototype 	<ul style="list-style-type: none"> Study how to build the electromagnetic energy harvester and build it. Test if it actually harvests energy by connecting it to a voltmeter
T2W10	<ul style="list-style-type: none"> Users are to use it consistently Users to provide cases where there were failures in functionality Users to also be asked about possible flaws and safety concerns (e.g. sharp edges on parts) 	<ul style="list-style-type: none"> Parts arrive Scale up to 3 User feedback Develop a better design Test FPC1020A capacitive and testing (to of the electromagnetic CAD case plates for 3D listen to sounds energy harvester such Test micro-implementation without context that it is compact and controller meaning and of a normal lighter 	<ul style="list-style-type: none"> Provide feedback on pleasantness and emotions.
T2W11	<ul style="list-style-type: none"> Users to continue with consistent use Users to provide details about struggles they faced using it, was there troubleshooting required How keen are children/adults/users in playing with it? Is there a loss of interest? 	<ul style="list-style-type: none"> First minimum viable prototype to conserve space and weight Test unlock mechanism Start development work on the app Test wireless/iOS protocols/API 	<ul style="list-style-type: none"> Cut down on physical size selection Round 2 sound CAD the lighter casing and print and insert the revised version of the electromagnetic energy harvester in the casing. Test whether the lighter can actually function and make amendments to ensure functionality and consistency of the prototype.
T2W12	<ul style="list-style-type: none"> After 4 weeks of consistent use, collect lighters back to observe for damages, areas showing signs of failure Ask users about final thoughts and possible preferences, likes and dislikes 	<ul style="list-style-type: none"> Refine/iterated prototype Complete app Implement lock mechanism in electrical and software side, integrated with the feature Calibration and testing Debugging any errors 	<ul style="list-style-type: none"> User feedback Add final touches to the prototype to make it more aesthetically pleasing and user-friendly/appealing to and guess its users. without context meaning and provide feedback on pleasantness and emotions. Confirmation of sounds

Prototyping Process



1 Initial Paper Prototype

- Initial lighter design to determine overall shape, size, ergonomics and finger placement.
- Figured out the placement of the different features on the surface of the lighter.

2 Initial Lock Mechanism

- iPod-style locking mechanism with physical padlock as a substitute.



3 Current Working Prototype

