

List of Requirements Validation

Category	Requirement	Remarks	Status
Safety	Limited mechanical forces, so as to not to cause injury	The holding torque is 34.3mN.m, enough for user interaction, but minimal to cause injury	Passed
	Should not have sharp edges	Edges are sharp in the MDF version. Organic hinges failed at 10mm radius fillet	Needs improvement
	Grooves should not let fingers get struck	Slider grooves are 3mm in width, less than the width of the little finger of a 10 year old Dutch child (Dined, 1993)	Passed
Reliability	Robust in structure, assembly and operation	'Robustness' was given a score of 72.5% of users while testing for Buyer's perception of Aesthetics.	Passed
	Should be based on standard computation devices	Computation based on Raspberry Pi, which was chosen for its reliable support, availability of packages and low cost (RPI Zero costs as low as 5 Euros). Input is a standard keyboard.	Passed
	Tethering should be based on wired connectivity	All peripherals, internal and external are wired physically. There is no dependence on wireless connectivity.	Passed
	The product should be able to bear a fall upto 4 ft	Fall test has not been yet conducted on the product. But loads on the organic hinges in the MDF variant could be the most probable breaking point.	Failed
	Internal components should not be affected by temperature and dust	Dust can still enter through the slider grooves. Can be covered by a thin layer of silicone, without affecting the interaction. Could be added in the next version.	Needs improvement
	The product should have backup power	All internal electronics, including the motors are powered with a 5V 2.1A, 5000mA power bank. But it requires the user to manually power on the power bank externally. The user again has to switch on the Rocker switch to ON the RPi. Power bank model can be changed	Needs improvement
	The battery backup should last longer than 3 hours in a single charge	There is no active power saving scheme. A NAND logic can be added later, to save power by turning off the inactive stepper motors,	Failed
Interaction	Should be usable for six hours without significant fatigue	Ergonomically, the product is within the reach of a child, sitting on chair and using the product on a table. Productivity test to be conducted, to measure time taken before fatigue appears in arm, while reaching out to product.	Needs improvement
	Be engaging and interactive for 12- 17 year olds	'Playful and engaging' was given a score of 85 on Buyer's perception of Aesthetics. Playfulness evaluation needs to be conducted.	Passed
	Use tactile use cues	Top left corner was filled at 40mm radius to show upright orientation and workspace window indicated by a downward indentation on the top surface.	Passed

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Category	Requirement	Remarks	Status
Interaction	User should be able to easily locate specific characters or words	Mapping of ASCII values to a joystick, interfaced to editors like EMACSpeak and Vim allows user to read character wise or word wise, navigate to specific character or word and move the cursor there	
	User should be able to skim code	Five stepper motors update button positions according to line indentation, allowing user to skim. It directly allows user to organise information he wants to listen, while creating the code logic in his mind	
	User should be able to use python language up to intermediate level	User can learn and use python till intermediate level (arithmetic, strings, booleans, comparison operators, loops, methods, functions)	
Production and Repairability	The product should be easy to assemble by low-skilled handlers (DIY).	A screw driver and resin adhesive are the only tools required to assemble this product	
	The product should follow DFMA design principles	The design has reduced number of parts, simplified part geometry, all housing parts can be cut from two wood sheets (MDF variant) or 3D printed from the same material (PLA), self centering parts for ease of assembly and intuitive assembly logic.	
	The product should be able to be replicated using most commonly available technologies	The product uses laser cutting, SLS (or FDM, as per availability) 3D printing, to be able to manufacture the entire product. PCB can be designed and assembled on-demand by external parties.	
Setup and Use	The product should be portable, and not weighing more than 3kg	The product weighs 2.5 kg and the height can be reduced by 32.8mm in version 2 with the use of micro-stepper drive	
	The user should be able to setup/ pack the product in less than 5 minutes	The product can be easily packed and unpacked with the flexible stand design. The startup time of the system is 1.894 s (Kernel 669ms + userspace 1.225 s)	
	The product should comply to the NEN safety regulations	The NEN safety guidelines are to be reviewed yet	
Wishes	The product should be easy for teachers to setup the product, even if he/she has little knowledge in technicalities	The pyPi installation package allows non-technical users to install and update the scripts with ease	
	The product should allow the user to collaborate with sighted/ non-sighted peers	Multi-modal interaction (Haptic + sound cues) with the product allows the user, to still take some time off to discuss/ collaborate with their peers. But audio feedback could be still a distraction	