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TACT - TOUCH ACTIVATED CALCULATOR

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BACKGROUND AND MOTIVATIONS

Blind and low-vision users cannot read a standard calculator's screen, forcing reliance on sighted help or technology that are slow to operate by touch. Off-the-shelf accessible calculators are rare and expensive.'

This project builds a low-cost standalone talking calculator on the STM32F411E-DISCO board. Every key press and result is spoken aloud, and results are also rendered on refreshable Braille modules so a user can read results by touch — combining audio and tactile feedback in one self-contained device, no PC or smartphone required.



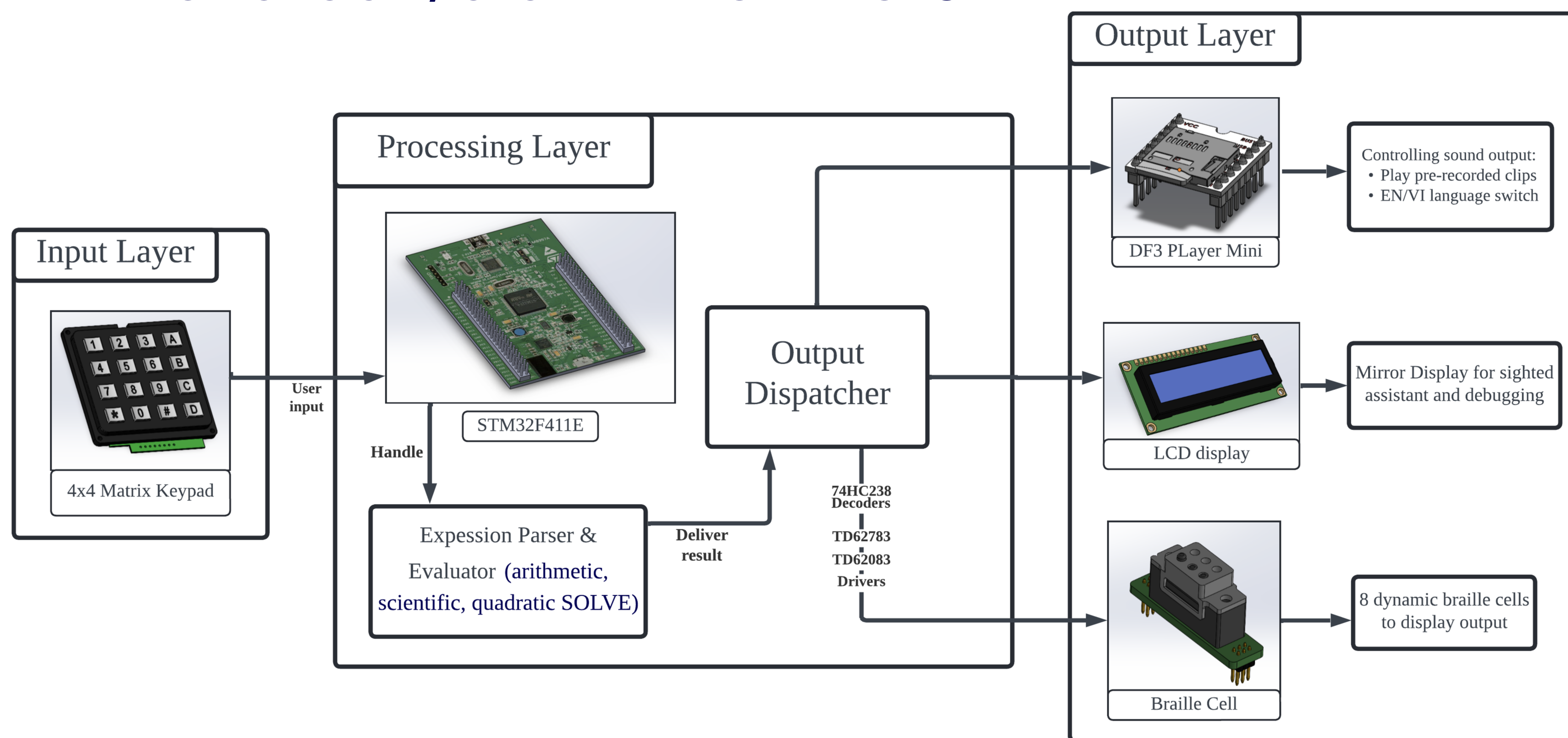
OBJECTIVES

Build a fully functional scientific calculator with special features assisting the blind in addition:

- On-press audio feedback (English & Vietnamese) via speaker & headphone jack
- Dynamic 6-dot Braille modules displaying math results for tactile reading
- Cost reduction for more approaching
- Aim to achieve approval for national examinations



METHODOLOGY / SYSTEM ARCHITECTURE

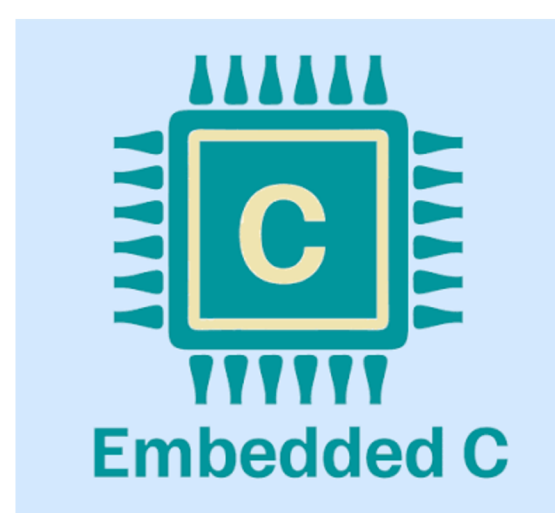


EVALUATION: TESTING & ACCESSIBILITY RESULTS

Aspect	Result
Screen-free operation	Fully usable by keypad + audio alone
Voice latency	Result spoken immediately; interruptible mid-clip
Bilingual (EN/VI)	Switchable at runtime
Scientific/ SOLVE	Arithmetic, scientific fns, quadratic roots
Braille result output	Driver + digit mapping in progress
Cost/ reproducibility	Low-cost dev board + common ICs, all sourced locally

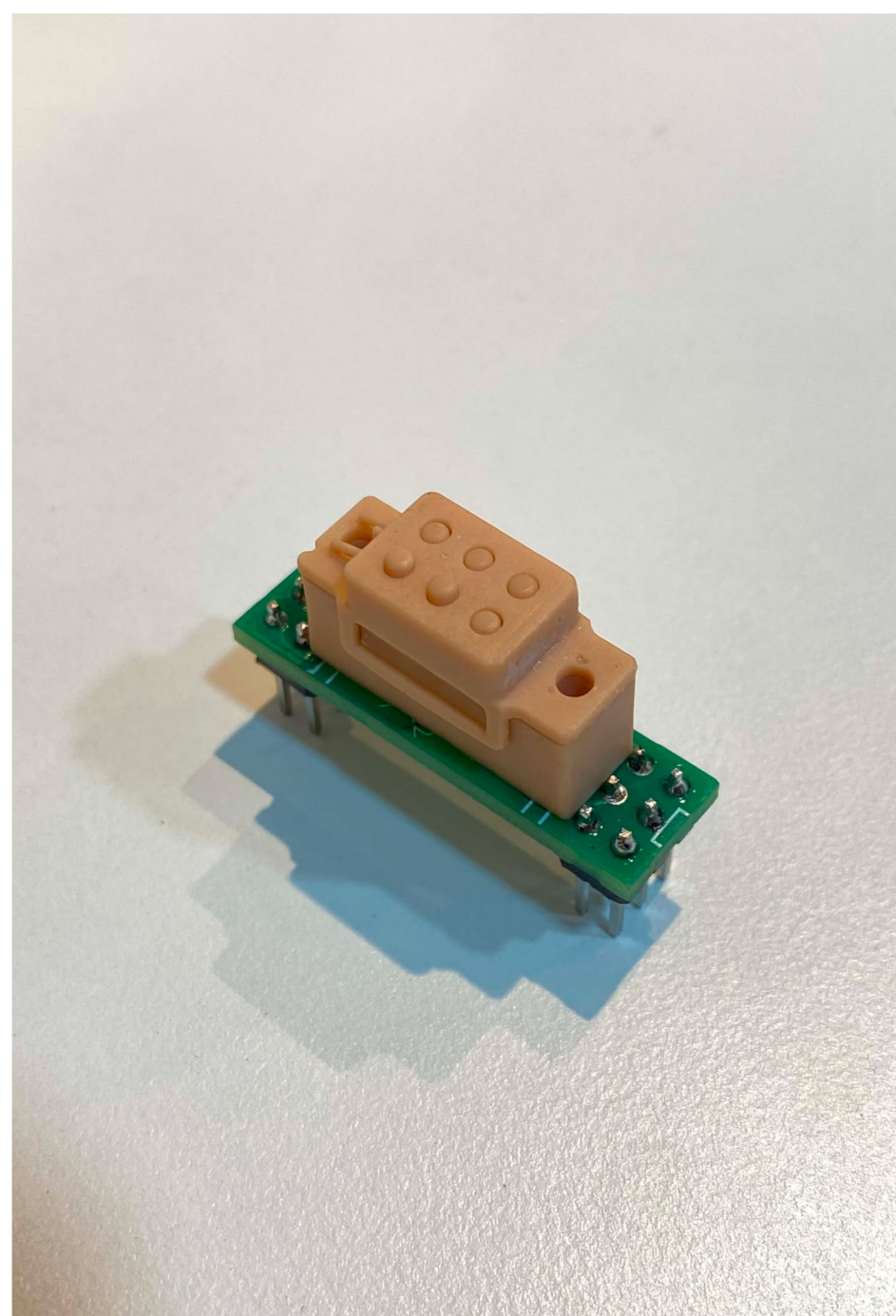
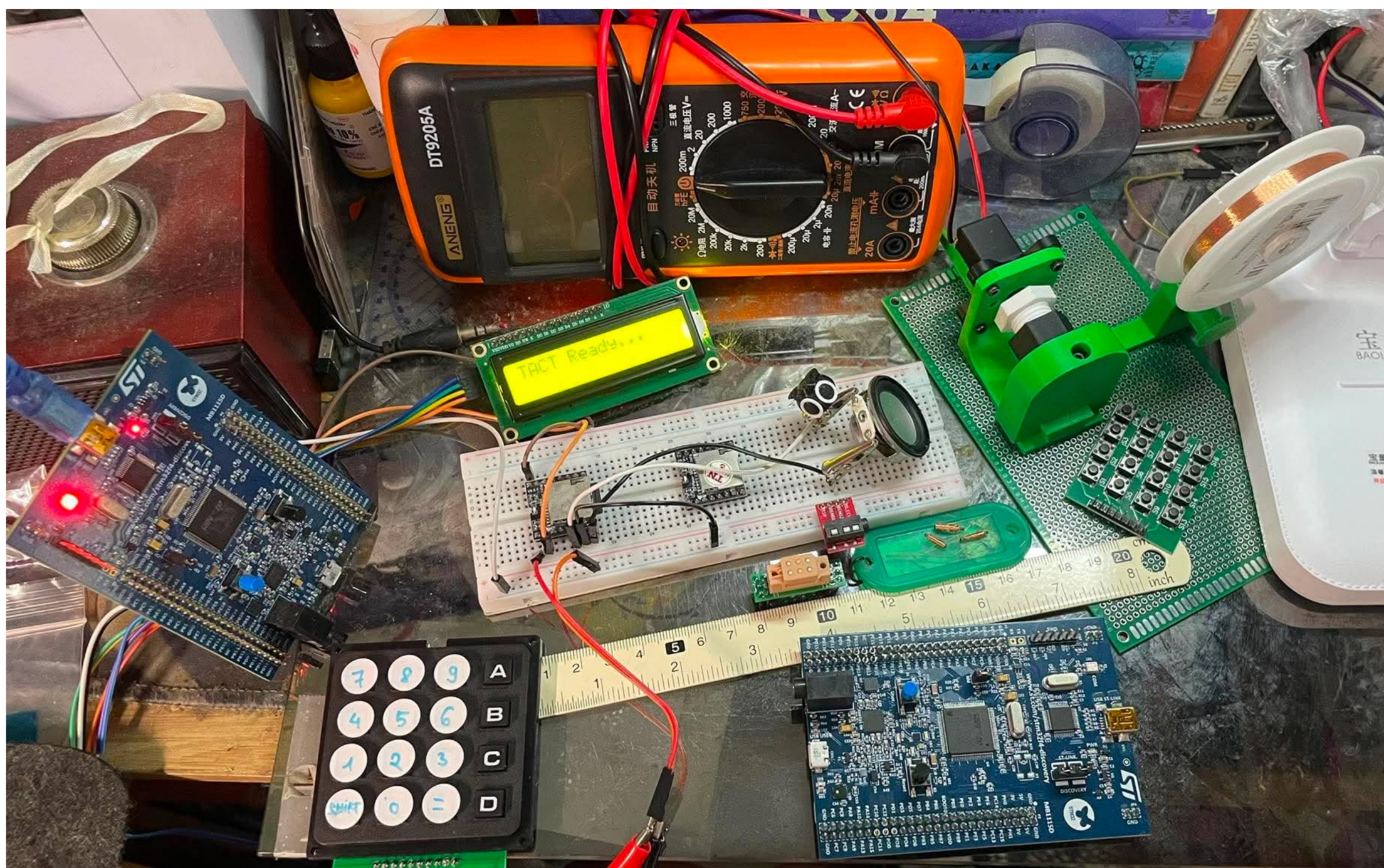


TOOL & TECH STACK



OUTCOME: SYSTEM DEMO & OUTPUT CHANNELS

- Working prototype on STM32F411E-DISCO with keypad + audio
- Talking output: each digit/operator and the final answer spoken
- Bilingual switch: same result read in EN or VI
- Interrupt read-back: pressing a key mid-speech cuts it off and acts immediately (feels responsive, not laggy)
- Scientific + SOLVE: e.g. enter a quadratic → hear/read both roots
- Braille result line: result shown as braille digits (in progress)



CONCLUSION & FINDINGS

This project delivers a self-contained accessible calculator that makes arithmetic usable without sight, combining audio and tactile braille output on affordable hardware. Speaking each key press and result — with interruptible read-back and bilingual support — lets a blind user operate the device confidently and independently.

The work shows that meaningful assistive technology can be built on low-cost microcontrollers, and lays a reusable foundation (multiplexed latching braille driver, differential refresh) for richer tactile output in future revisions.