

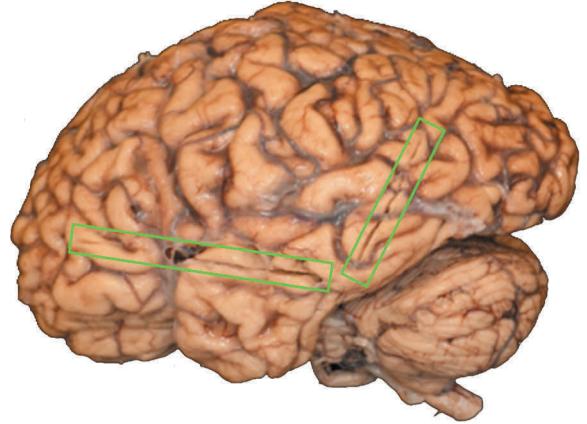


# Automated Brain Detection System for the Mopec 810 Stryker Saw to Prevent Tissue Damage While Cutting Bone

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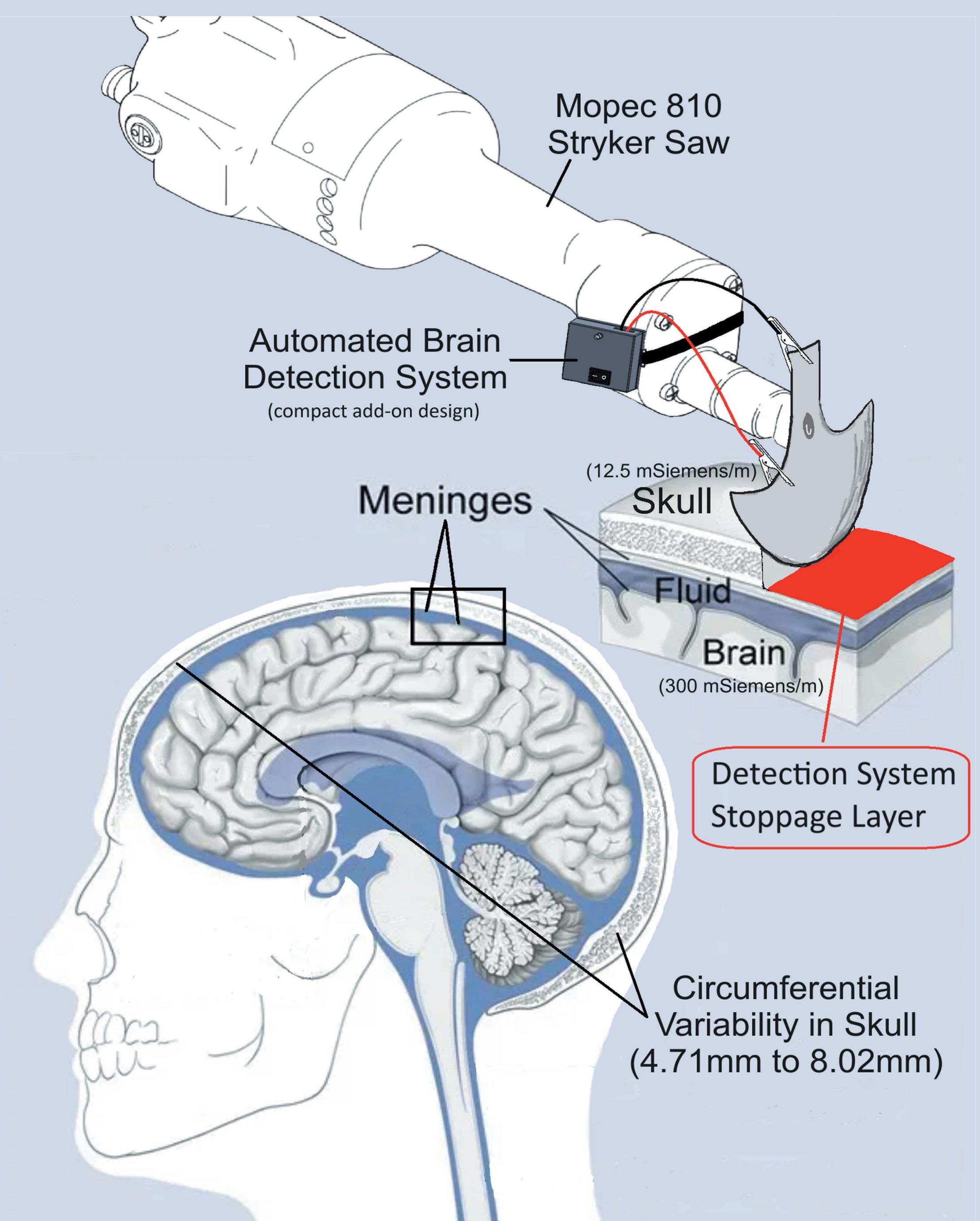
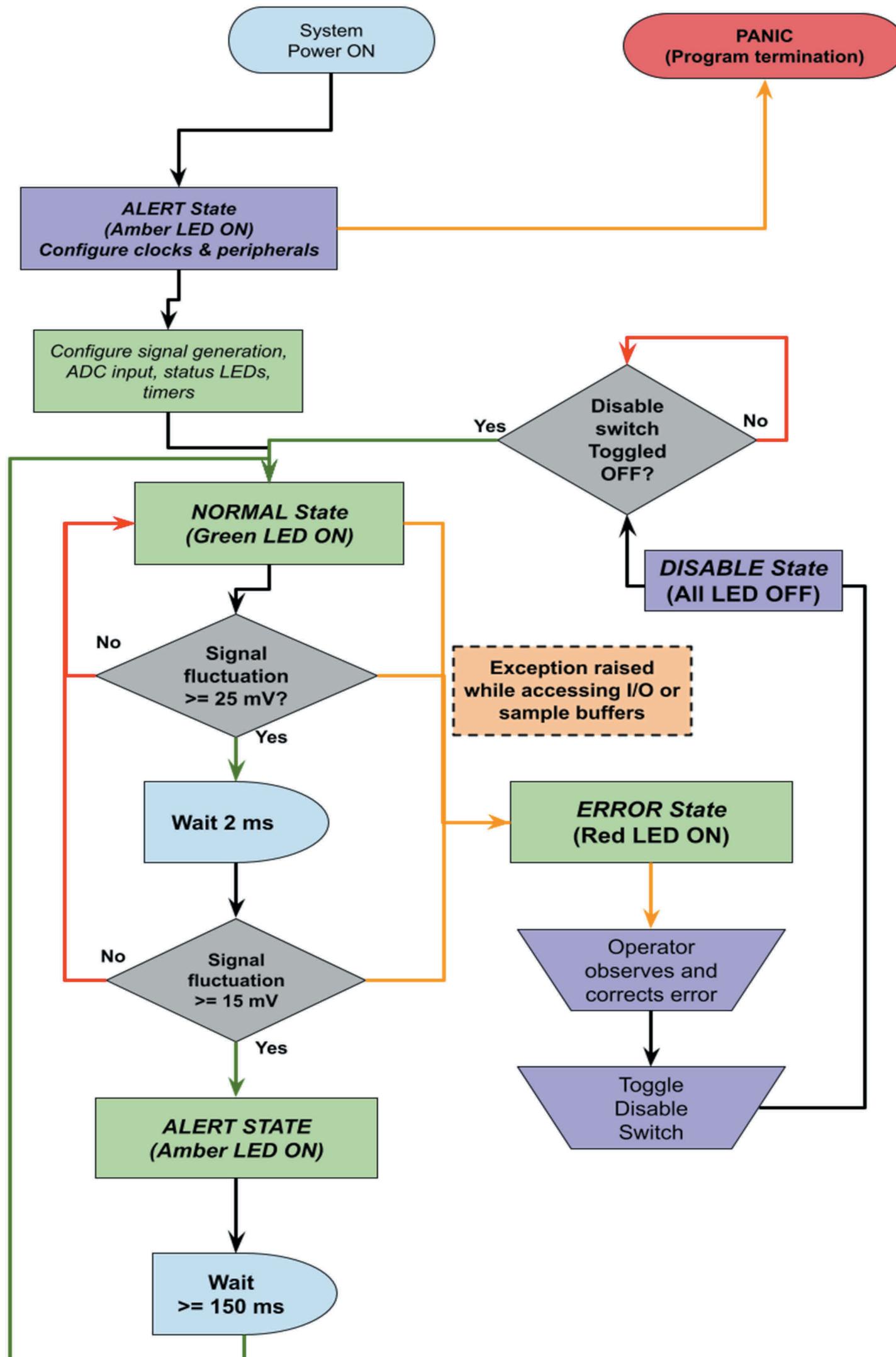
## 1.0 Current Cranial Autopsy Methods Cause Damage to the Brain Tissue

- Limited user feedback prior to tissue contact
- Damage prevention reliant on practitioner
- Cuts in tissue can affect evidence used to determine cause of death

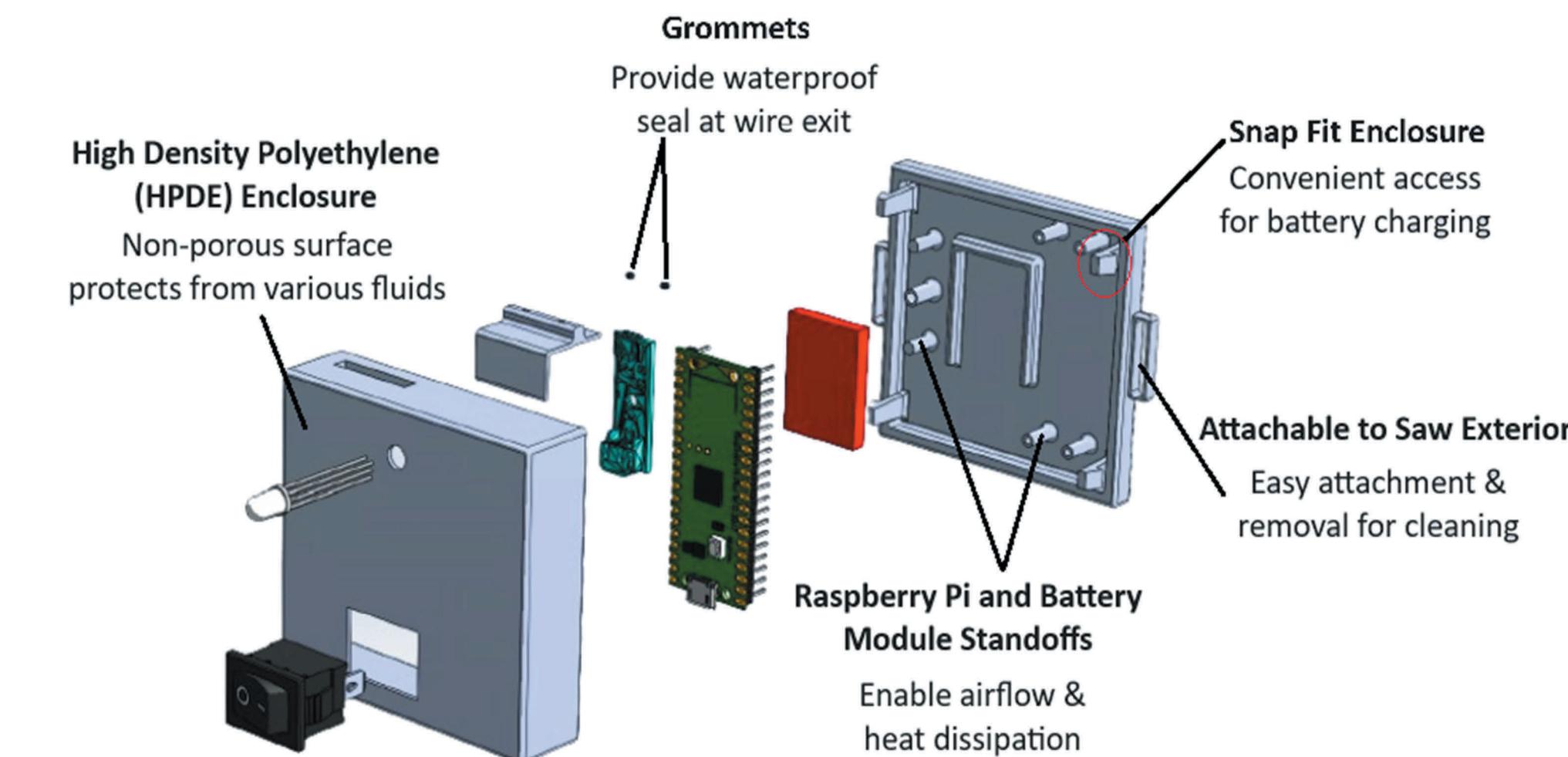


## 2.0 Real Time Brain Detection System and Alert Mechanism via Capacitive Sensing

- Capacitive sensing to differentiate between skull and brain tissue
- LED alerts operator when saw contacts the meninges layer
- Voltage changes averaged over 2ms intervals mimics benchmarked SawStop®
- 8-bit accuracy via ADC with high precision and sampling rate, and low data storage requirements

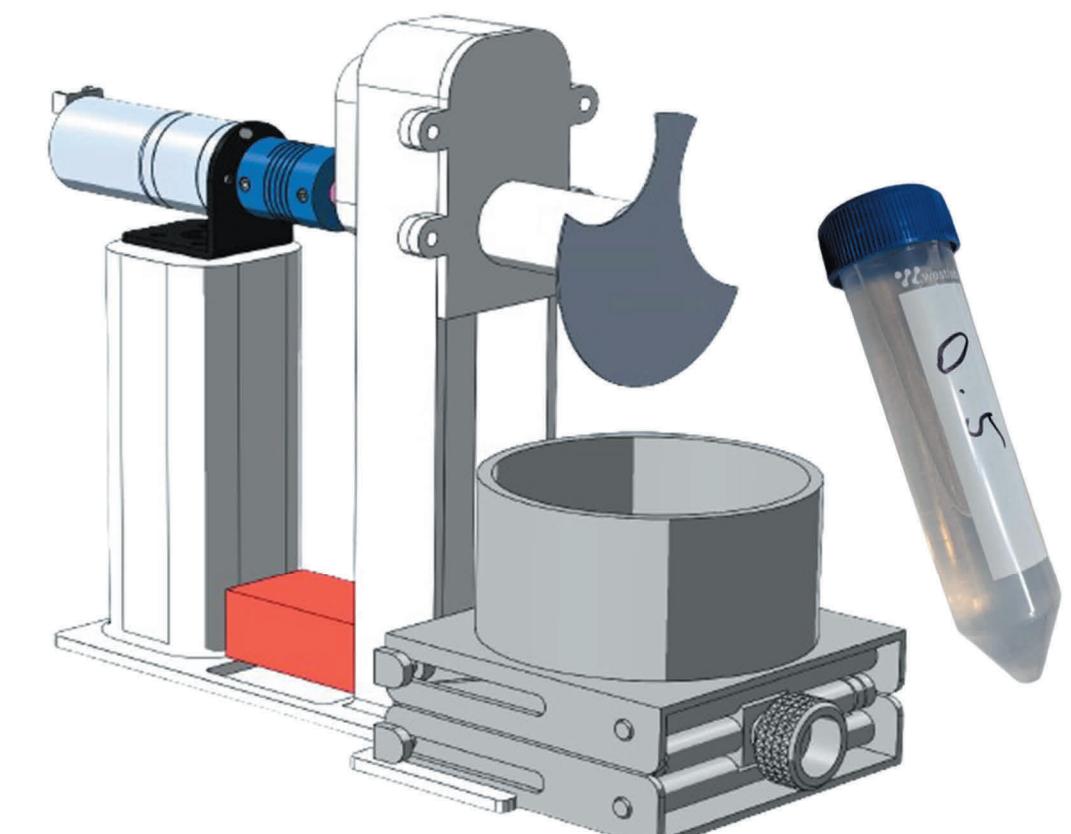


## 3.0 Brain Detection System Components are Versatile and Easy to Assemble



## 4.0 Circuit Sensitivity and Response Time Validated Through Prototyping

- Scaled down vibrational testing on brain & skull pseudo-material with comparable conductivity
  - 0.5 mg/mL NaCl / 6.04 mg/mL gelatin powder hydrogels (brain)
  - High-purity gypsum plaster (skull)



## 5.0 Benefits of the Brain Detection System

- Brain tissue detected in <0.02 sec with a sensitivity of 25mV
- System is cost effective (<\$100)
- Real time detection is a step towards automated autopsy saws

**Next Steps:** validation of system on an operational saw using similar brain and skull pseudo-materials

## 6.0 References & Acknowledgements

We would like to thank Dr. Kamran Behdinan, Dr. Christopher Ball, Mr. Ranjan Mishra, and Dr. Fabio Tironi for their guidance throughout this project.  
 [1] Dr.Samanthi, "Difference between brain and spinal cord meninges," Difference Between, <https://www.differencebetween.com/difference-between-brain-and-spinal-cord-meninges/> (accessed Apr. 3, 2024).

Subject Material	Response Time	Detected $\Delta V_{range}$	Detected $\Delta V_{avg}$
Brain Analog	2.4 ms	25 mV	0.8 V
Nerve-dense skin (fingertip)	5 ms	25 mV	0.33 V
Skull Analog	5 ms	15 mV	< 50 mV