Priyatoonz Brainwaves
(PoC and Prototype)

The Priyatoonz Brainwaves is intended to give scientific basis for Child Education, Entertainment, Animation, Games, Virtual/Mix/Augmented Reality content development and studies on Child Mental and Physical Development. It also intends to develop facial expression capture and motion capture for animation production automation in future. The brainwave system has three parts: 1. Child Wearable Electronics, 2. AI Processing Unit and 3. Mac, iPhone, and/or iPad for Content Development, Visualization, Monitoring and Control. Besides this, it also has some applications in automobile, aircraft, industrial and military training etc.

1. Child Wearable Electronics consists of:

Mike Speaker Headset	EEG Band	EEG Cap	EMG Tracksuit	SiFive HiFive1	STM32 Nucleo LoRa Wireless	Lithium Ion Battery Pack

2. AI Processing Unit consists of Quantum Speech AI and Priyatoonz Brainwaves AI, both running on top of SiFive Freedom e-SDK which in turn running on Digilent ARTY A7-100T and STM32 Nucleo LoRa Wireless as shown above:

Please visit www.github.com/quantum-speech for more details on Quantum-Speech AI. With the help of SiFive, we intend to convert this part (except STM32 Nucleo LoRa Wireless) of the prototype into SiFive Series 7 64bit Semiconductor System on Chip (SoC) for mass scale application at production stage. Please visit www.sifive.com, for more details on SiFive and read implementation section given below for more details on implementation plan.

Priyatoonz Animation Pvt Ltd
120, Aggarwal City Square, Manglam Place, Sector-3, Rohini, Delhi 110085 India
Landline: +91-11-45093759 Website: www.priyatoonz.com

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3. . Mac, iPhone, and/or iPad for Content Development, Visualization, Monitoring and Control.

iPhone   **iPad**   **Mac Mini**

Some Applications other than our Mainstream Application

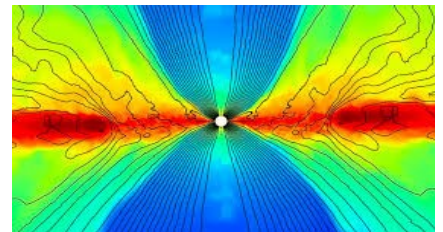

Robotic Control   **Aircraft Training**   **Industrial Training**

Medical Care   **Virtual Reality**   **Simulation**

Driver Training   **Augmented Reality**

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Implementation

The journey from PoC/Prototype to Production will involve lot of challenges on marketing, technical and financial fronts. Since Priyatoonz has good experience in child edutainment content development, and is backed by Anasim, SiFive and STMicrosystems for technology, the implementation plan is drawn as below:

Initially our AI framework for Brainwaves and Speech/Emotion Recognition alongwith Digital Signal Processing (DSP), Quantum Computing Emulator (QCE) will run on the Mac OS. And gradually it will be shifted to Freedom e-SDK running on ARTY A7-100T relieving Mac OS to do Content Development, Visualization, Monitoring and Control jobs. Meanwhile, we will also move on to SiFive Series 7 64-bits Vector/SIMD enabled IP Cores whenever compatible Vector/SIMD enabled GCC support is available.

SiFive HiFive 1, Rev B or latest, (for Child Wearable Electronics) will be suffice for Proof of Concept (PoC) as rest of the system will always be available on Mac OS, but once the above mentioned Prototype based on ARTY A7-100T with SiFive Series 7 64-bits Vector/SIMD enabled IP Cores is completed we will move on from FPGA towards ASIC by moving on to Microsoft Azure based Cadence Services provided by SiFive. After completing the ASIC verification/validation process, with the help of SiFive, the project implementation will move to TSMC, Taiwan for some prototype ASIC production and then in due course of time for mass scale production. **Apart from some brainwave application areas given in the previous two pages, the semiconductor chips so produced will find its use in AI enabled IoT, AI enabled Embedded Devices, AI enabled Edge-Devices/Gateways/Routers, AI enabled multi-chip PCIe cards for cloud, massively clustered stacks for AI training and testing.**

We have already tested STMicrosystem LoRa Wireless (also serving as electrical isolation safetynet for children). Its working perfectly fine with Beaglebone Black and Digilant Zybo boards. The wireless technology has also been tested with multi channel LoRa gateways so that a centralized Apple Mac based Content Development, Visualization, Monitoring and Control is possible. MQTT framework for inter-gateway communication has also been tested for much larger scale implementations. MQTT is a cloud compatible protocol, so deployment in physically scattered and distant areas is again no problem. LoRa to LoRa device, line of sight connectivity upto 10 kilometers has been physically verified in rough terrains and weather around Koyna Nagar (Maharashtra), Pune (Maharashtra), Nashik (Maharashtra) and Belgavi (Karnataka) areas. AI frameworks have been tested separately. Content development process is going on C3D and Unity3D for more than 4 years. For those who are looking for LoRa wireless substitute for indoor applications, Texas Instruments CC3200 Wifi chip is an option which is also duly tested and easily available.

On financial and marketing side, the project is backed by well-to-do, well-settled in Delhi & abroad, well-educated, well-connected business families hailing from Punjab & Haryana.

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