

We are the world experts in CSR Kalimba DSP software development.

David Hargreaves invented the Kalimba DSP processor, grew and led the CSR R&D DSP Software group, and has built up over the last 12 years in-depth knowledge of CSR's Bluetooth chips.

IC Innovate offers the following services for CSR customers and partners:

- ✓ **Custom Kalimba DSP software development. Ranging from blank-sheet-of-paper algorithm design (e.g. in Matlab) to porting of existing fixed or floating point source.**
- ✓ **Debugging of complex system problems (covering hardware, firmware, VM, & Kalimba).**
- ✓ **Optimisation of existing solutions to save MIPS, memory, and increase battery life.**
- ✓ **New product development advice and brainstorming.**
- ✓ **Expert Kalimba DSP training tailored to your needs.**



IC Innovate is an engineering consultancy with strong expertise in digital chip design, DSP, and software, established in 2011 by David Hargreaves. From 2000 to 2004 he single-handedly developed the Kalimba DSP processor along with all software for it (the very first single chip BT stereo headset running on BC3-MM). He then grew and led CSR's R&D DSP Software and Processor group following the huge success of the BC3/5/7-MM chips. His hardware design and software is now in >250 million Bluetooth products. He holds a first class masters degree with distinction, from the University of Cambridge, and has 10 patents in the field of audio and processor design.

At CSR Dave developed from scratch:

- All of CSR's highly optimised voice and music codecs: SBC, mp3 (decoder and encoder), WMA, AAC, AAC+.
- CSR's Low Latency FastStream codec, CSR's True Wireless Stereo implementation, CSR's Internet radio audio software.

- The underlying Kalimba infrastructure and framework code for mono and stereo headsets.
- LCD and OLED graphics drivers, SD card, audio enhancements.
- Various debugging tools.
- The PC based instruction set simulator for Kalimba (kalsim).

IC Innovate has deep knowledge of CSR's chips, a very efficient development cycle, and importantly a well proven track record. Being a small company we're easy to work with, flexible, and cost effective.

Examples of recent client work:

- Efficiently porting (both in MIPS and arithmetic precision) a number of floating point Matlab audio processing algorithms. Delivered to a very tight timescale (product launched by tier 1 customer within weeks).
- Development of Over The Air upgrade technology. Voice prompts held in BlueCore's flash memory can be updated over Bluetooth (e.g. from a Smart phone app).
- Debugging and fault fixing Kalimba software on various BT audio products (SBC, AAC, APTx)
- Automotive: Updating a CVC Hands-free implementation to work with a 48KHz I2S audio interface.
- iPhone application development and matching BlueCore software to transfer custom data over BT (using the Apple iAP/MFi chip for authentication)

Please email me to discuss your project. I look forward to working with you.

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