

# Developing a Programmable “Interactive Ball” for Junior Blind Sports

Surya Singh, Paul Pounds, Hanna Kurniawati,  
Louise Arvier, Ben McFie and Gerrard Gosens

<sup>1</sup> The robotics design lab



vision  
australia

blindness and low vision services



Vision 2014 Melbourne

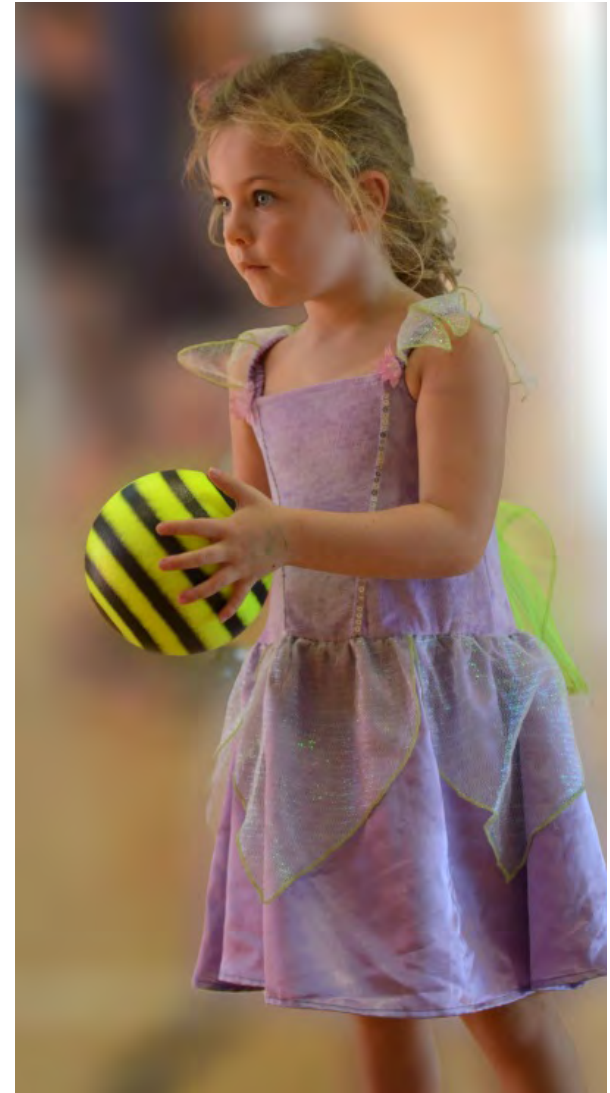
<http://robotics.itee.uq.edu.au>

April 2, 2014

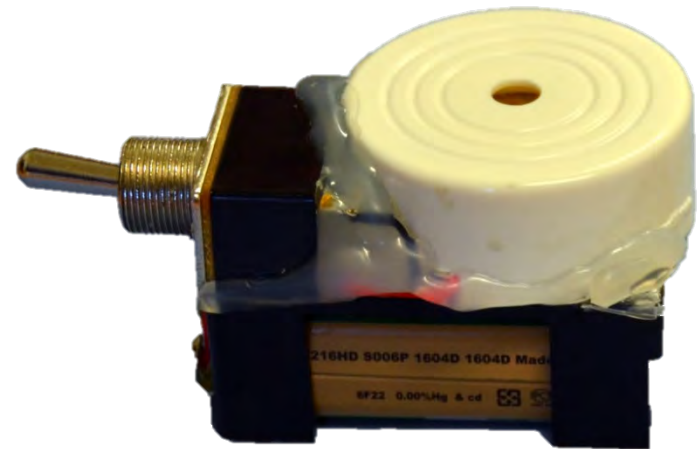
# The Interactive-Ball



# Our Goal: Accessible Robotics



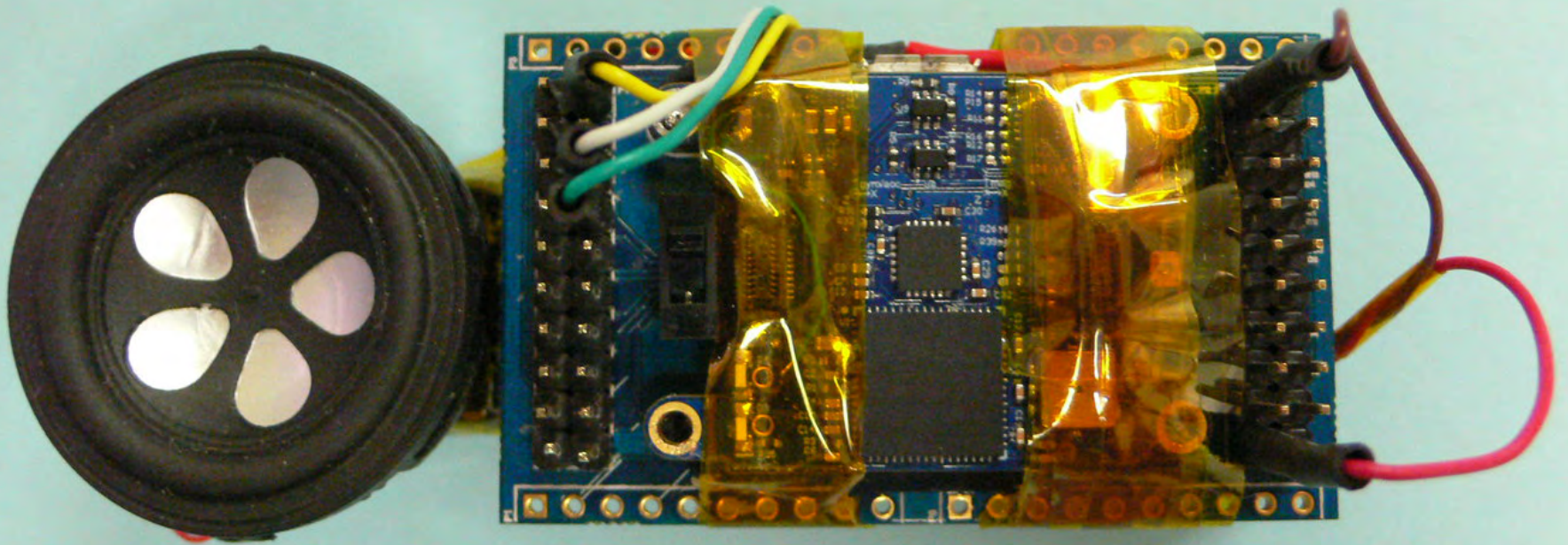
# Current Aids Are Not Smart

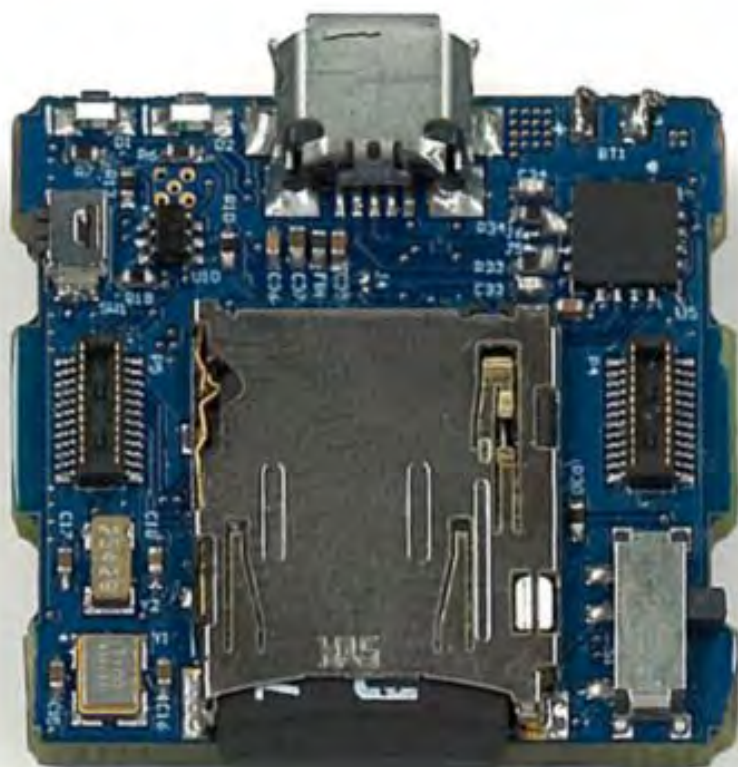














# The Devil is in the Details

```
    DAC_SPIBUF = (((((unsigned short)(imp_buff + 32767) << 4)) & 0x0FFF) % 4095);
    if (playEnable)
    {
        if (bufFlag)
        {
            LATGCLR = 0x200;
            DAC_SPIBUF = (unsigned short)((((unsigned short)(AudioBuffer1[FifoCt] + 32767) << 4)) & 0x0FFF) % 4095;
            fool = ((AudioBuffer1[FifoCt] + 32767) >> 4) & 0x0FFF;
            DAC_SPIBUF = fool;
            while(DAC_SPISTATbits.SPIBUSY);
            while(!DAC_SPISTATbits.SRMT);
            LATGSET = 0x200;
        }
        else if (!bufFlag)
        {
            LATGCLR = 0x200;
            foo2 = (unsigned short)((((unsigned short)(AudioBuffer2[FifoCt] + 32767) << 4)) & 0x0FFF));
            DAC_SPIBUF = (unsigned short)((((unsigned short)(AudioBuffer2[FifoCt] + 32767) << 4)) & 0x0FFF) % 4095;
            DAC_SPIBUF = foo2;
            while(DAC_SPISTATbits.SPIBUSY);
            while(!DAC_SPISTATbits.SRMT);
            LATGSET = 0x200;
        }
        FifoCt++;
        if (FifoCt == 255)
        {
            bufFlag = !bufFlag;
            FifoCt = 0;
        }
        else if (FifoCt == 127)
        {
            ReadEN = true;
        }
    }

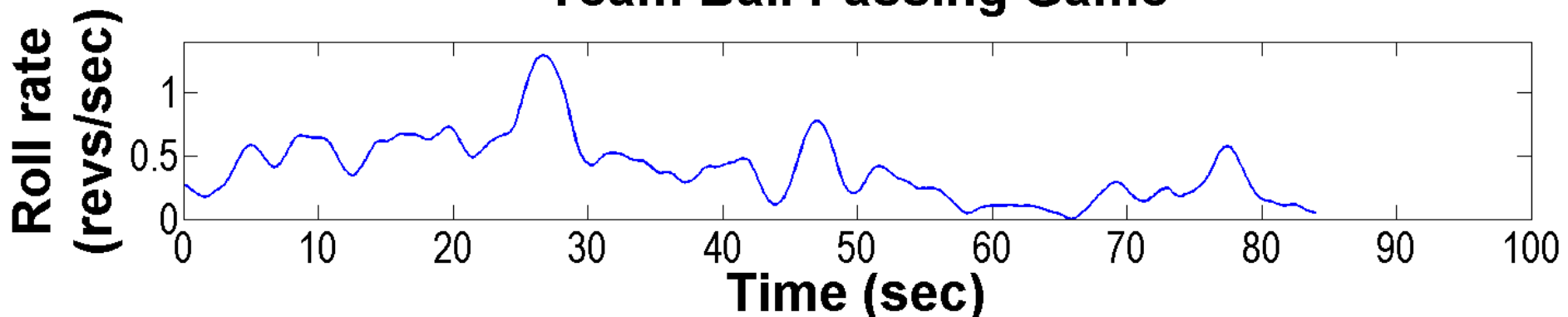
    IFS0bits.T1IF = 0;
}
```







## Roll Motion Team Ball Passing Game













# Unexpected Challenges



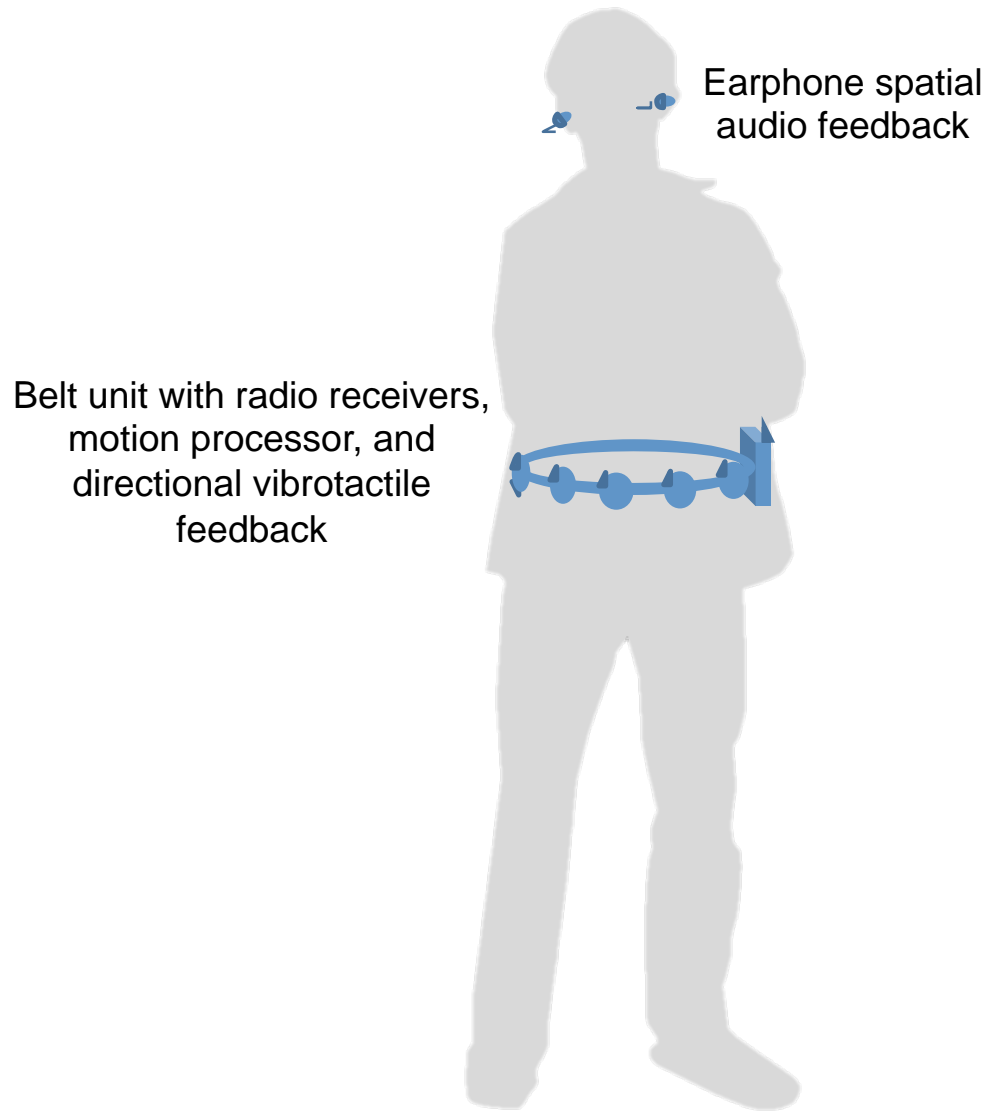


# Thank you

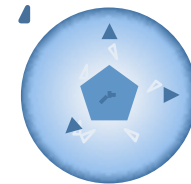




# Future Research Directions

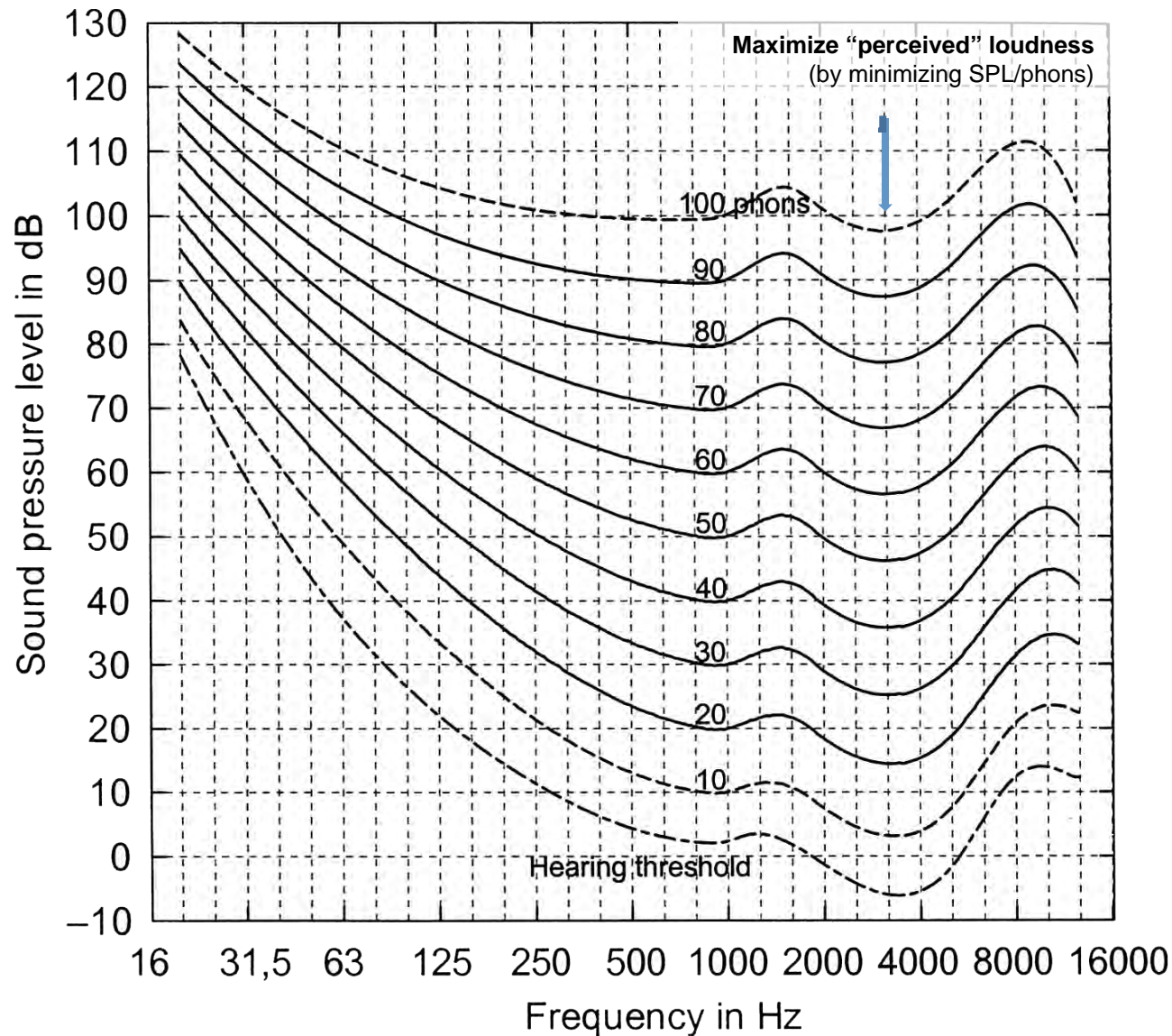


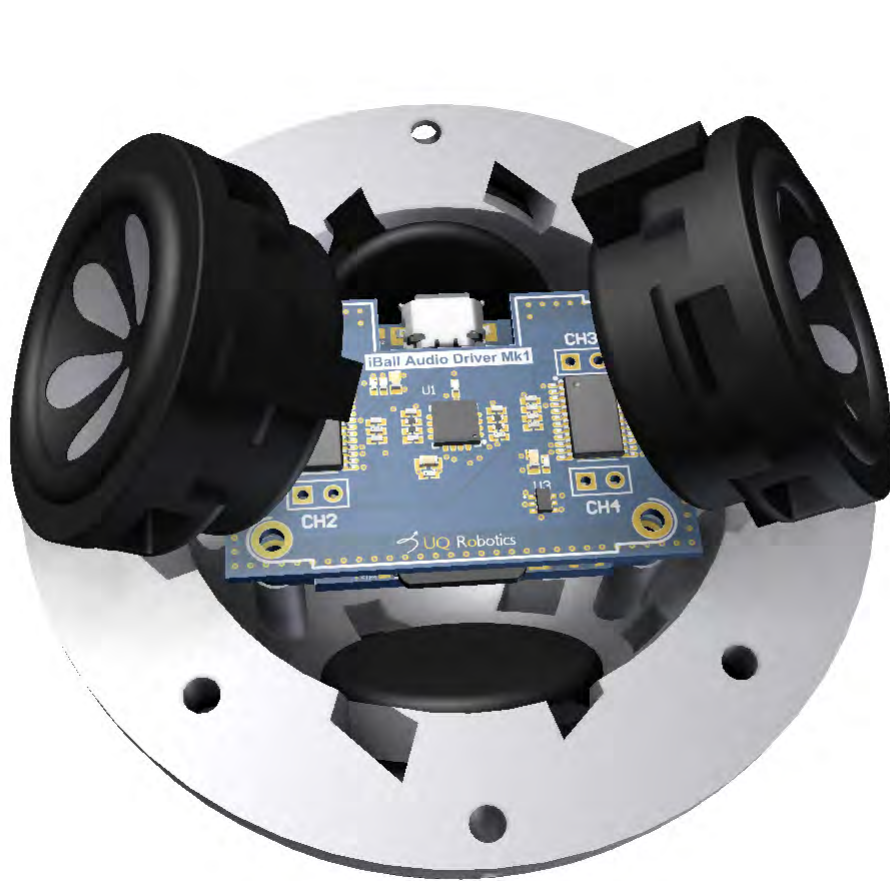
wireless signals



I-Ball with inertial sensors, ultrasonic and wireless transmitter module

# Psychoacoustics for the Visually Impaired







# Future Research Directions

Year	Development	Sensors	Motion feedback	Feedback mode	Social benefit
2012	I-Ball 1.0 concept	Inertial	Bearing, speed	Audible buzzer	Improved interaction
2013	I-Ball 2.0	Inertial	Bearing, speed	Quadraphonic audio output	Easier audition and localisation
2014	I-Ball 3.0	Inertial	Bearing, speed	Wireless bone-conduction	Inconspicuous, greater peer acceptance
...	I-Ball with spatial sensor fusion	Inertial-ultrasonic	Range, bearing, velocity	Audio-tactile, bone conduction	Improved situational awareness
...	I-Ball with planning algorithm	Visual tracking	Range, bearing, velocity	Audio-tactile, bone conduction	Improved teamwork