DataSpoon: Assisting Caregivers of Children with Cerebral Palsy

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Abstract
Many children with cerebral palsy (CP) encounter great difficulties mastering self-feeding. We present a prototype for assessing their self-feeding skills via a novel instrumented spoon that monitors upper extremity biomechanics involved in eating.

Author Keywords
Cerebral palsy; self-feeding; assessment; children.

ACM Classification Keywords

Introduction
Cerebral Palsy (CP) describes a group of developmental disorders of movement and posture leading to activity restriction that is attributed to disturbances occurring in the fetal or infant brain [2]. Children with CP often have significant difficulties mastering self-feeding [3]. Disruption in eating may lead to malnutrition, poor growth, developmental delay and loss of general health and well-being [1].

We set out to assess the self-feeding skills of young children with CP via a novel instrumented spoon that monitors several biomechanical variables of the upper extremity involved in self-feeding. Providing this data
to professional caregivers will lead to more effective treatment of self-feeding difficulties.

**DataSpoon**

DataSpoon uses the IMUduino BTLE board ([http://www.femtduino.com/spex/imuduino-btle](http://www.femtduino.com/spex/imuduino-btle)) for sensing and communication. This 40x16mm Arduino clone includes a 3-axis gyroscope, 3-axis accelerometer, and 3-axis digital compass. Cell batteries are used to power the board. The board also contains a Bluetooth Low Energy chip, which we pair wirelessly with an Android phone to perform data logging. The phone receives the data in realtime.

The exterior part of the spoon is 3-D printed, tailored to the exact size of the electronic parts (see Figure 1). The chosen material is plastic, which is water-resistant, light-weighted, and suited for children.

![Figure 1. Initial prototype of DataSpoon.](image)

We developed an application for Android mobile devices, which analyzes the data collected with DataSpoon, and presents it as a graph (see Figure 2). Based on this graph, professional caregivers can adjust treatment plans to the specific skill level of each child, and track subtle changes in hand movements.

![Figure 2. The output of DataSpoon is presented as a graph.](image)

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References