Vision Screening System

Researchers from the University of Auckland are developing a vision screening system to accurately and reliably detect visual function in young children, a problem that currently has no solution.

The vision screening system is based on automatic detection and evaluation of Optokinetic nystagmus (OKN).

Assessing visual function in children is a challenging task and there is currently no accurate and reliable clinical test for young children. Undetected vision problems can lead to abnormal visual development and poorer intervention outcomes. Effective interventions are often possible as long as the vision problem is detected early.

In NZ, vision is tested when a child is 4 years old as part of the 'B4 School Check'. Due to inaccurate measurements, there is a high over-referral rate, causing a burden on ophthalmology services. This same sequence of events is happening in other parts of the world, making this a significant problem. Our technology aims to provide the solution.

This technology is based on a reflexive pattern of eye movements called OKN, which can be used to assess visual function. When the eyes detect a continuously moving pattern, they will first track a feature of the pattern and then move rapidly in the opposite direction before reinitiating the tracking movement. This characteristic movement profile will only occur if the stimulus is seen by the subject. Therefore the presence or absence of OKN indicates the visibility of the visual stimulus. There is no objective method for quantifying OKN that is currently used routinely in clinical or community settings.

Combining the technology’s novel image processing and head stabilisation algorithms with a visual stimulus display system; we are able to rapidly and objectively assess visual function in young children. The head stabilisation technology avoids the use of discomforting head mounts and chin rests, adding to the competitive edge.

OKN is also a surrogate marker for fatigue. Saccadic eye movements are one of two phases of OKN, with slower saccades indicating fatigue. Therefore, this technology has a possible application in this area.

Current Development Stage

Currently in the process of finalising a prototype.

Data based on the current prototype shows it to be validated. This screen has proven to be effective in detecting OKN in adults (93% accuracy over 115 trials) as well as effective in stabilising head and eye regions in videos of children. The use of OKN to assess visual processing has proven to be successful in >350 two year old children. Furthermore this screen has a high signal correlation to OKN (99.08%) highlighting the advantage of being able to use low cost devices.
IP Position
This screen uses an optical flow method to analyse the eye movements, which has not previously been done. A novel head stabilisation method is also incorporated in order to yield a stable image. A PCT patent based on both of these methods has been filed.

Competitive Advantage
• Novel algorithms makes this a unique screening method
• Quick, objective, accurate and reliable screen – aids early detection of visual deficits which significantly improves treatment outcomes
• Low cost, portable system
• Can test very young children – as young as 18 months old
• Non-contact, no discomfort – no chin rest or head mounts involved
• Can be used by a non-expert – no training required

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