Solving the 3D Problem—The History and Development of Viable Domestic 3DTV Displays

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13.1 Introduction

Domestic television and video display is central to one of the largest consumer electronics markets in the world and the prize for developing a technically capable, and commercially viable domestic-suitable 3D video display system is likely to be great. Producing such a domestic 3D video system places great demands on innovation, research and development, but with recent advances in the enabling technologies such displays are now within our grasp. This paper starts by giving a brief history of the many attempts to produce a viable domestic 3D video display, illustrating the pioneers who first initiated research on 3D domestic displays. This paper then outlines and discusses the essential requirements that would be necessary to fulfil viewer expectations of a viable and usable domestic 3D video display. These demands are then placed in the context of the historical attempts to produce viable 3D displays, showing how these attempts have informed current thinking by outlining the problems of each technology approach. The paper then goes on to describe possible contemporary approaches to producing domestic 3D video displays, discussing the current viability of each, and showing that although there are many current solutions, these are often not suitable for domestic use. The paper then shows the development, based on historical work and contemporary thinking and technology, of viable 3D domestic video displays for both single viewer use and multiple viewer use that are hoped will fulfil the demands of domestic use. The paper summarises with the prediction that within the next 10 years we will see domestic 3D video displays readily available and accepted by the market place.

13.2 A Brief History of Domestic 3D Video Display

Although 3D video and television have never been regularly demonstrated or broadcast, there have been several systems proposed and demonstrated over
the years, and there are those that are proposed for the future. These range from the first demonstration of 3D television by John Logie Baird in the 1940’s through to a proposed Japanese system for 2020.

13.2.1 Baird’s System

John Logie Baird, arguably the inventor of television, pioneered a 30-line mechanical television in the late 1920s, though this mechanical system was not adopted for broadcast as a superior electronic 405-line system was favoured by the BBC in the UK. After the liquidation of the Baird Company, Baird experimented independently on 3D colour television with screen sizes ranging from 60cm to 76cm using a 600-line image interlaced six times. His first demonstration of 3D television (or stereoscopic television as it was then called) was made to a selected audience on 9th August 1928. Writing for ‘Television’ in September of that year Dr C Tierney wrote an account of that demonstration: “A man sitting before a transmitter was very clearly seen on the screen of a receiver situated in another part of the building, in perfect relief, showing the facial delineation and expression both with and without optical assistance. These experiments promise considerable development and importance in their practical application”. Baird continued development and in 1940 developed a system where scanning was carried out by an electronic ‘flying spot’ method, similar to that used a few years earlier in cinema television demonstrations. Some mechanical operation was still included, in the form of a set of 3 rotating primary colour filters, on the same principle as his first colour television in 1928. This was demonstrated to reporters on a 75cm \( \times \) 60cm screen in December 1940. Finally Baird’s stereoscopic television was developed for high definition (500 lines) colour transmission and successfully demonstrated in late 1941. This technique did not require the wearing of special glasses by the viewer, but it was necessary for the viewer’s head to stay in one position to see the stereoscopic effect.

13.2.2 Rollman’s Anaglyph

In 1853 Wilhelm Rollman first illustrated the anaglyph principle of using blue and red line drawings on a black background to produce a 3D effect when observed wearing red and blue filter glasses. In 1858 Joseph D’Almeida used this principle to project 3D magic lantern slide shows using red and green filters, with the audience observing the images through red and green glasses. Louis Ducas du Hauron produced the first printed anaglyphs in 1891 by printing two negatives on the same paper, one in blue or green, and one in red to create the anaglyph effect. James Butterfield, Stanton Alger and Dan Symmes authored a patent for a 3D stereoscopic television system dated March 29, 1988; this included a theoretical discussion of full colour anaglyph method. These historical developments produced many later technological developments for colour 3D anaglyph movies, 3D videos and 3D photography that were essentially reinventions of previous ideas.