

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS INC.
Petitioner

v.

ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE
Patent Owner

IPR2021-00827
Patent 9,781,448

DECLARATION OF DR. IMMANUEL FREEDMAN

IPR2021-00827

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I, Dr. Immanuel Freedman, hereby declare the following:

I. BACKGROUND AND QUALIFICATIONS

1. My name is Immanuel Freedman, and I am over 21 years of age and otherwise competent to make this Declaration. I make this Declaration based on facts and matters within my own knowledge and on information provided to me by others, and, if called as a witness, I could and would competently testify to the matters set forth herein.

2. I have been retained as a technical expert witness in this matter by Counsel for the Petitioner, Unified Patents, LLC (“Petitioner”) to provide my independent opinions on certain issues requested by Counsel for Petitioner relating to the accompanying Petition for *Inter Partes* Review of U.S. Patent No. 9,781,448 (“the ’448 patent”). My compensation in this matter is not based on the substance of my opinions or on the outcome of this matter. I have been informed that GE Video Compression, LLC is the purported owner of the ’448 patent. I note that I have no financial interest in GE Video Compression, LLC, or Petitioner, and I have no other interest in the outcome of this matter.

3. I have over 30 years of industry experience, including a substantial portion of which was spent working with image and video coding and developing models and simulations to analyze various video and imaging systems. I have summarized in this section my educational background, career history, and other

qualifications relevant to this matter. I have also included a current version of my curriculum vitae as Exhibit 1007.

A. Education

4. I earned a Bachelor of Science degree in Physics from the University of Durham, England, in 1979. I obtained a Doctorate in Physics from the University of Physics from the University of Durham, England in 1986. Between obtaining my undergraduate and Doctorate degree, I developed a microcomputer system for detecting coalmine fires and heatings as a scientist for the National Coal Board and worked as a software engineer for Laser-Scan Ltd. in Cambridge, England.

B. Career Synopsis

5. After obtaining my Doctorate, I served as a Research Assistant at University College London from September 1986 to June 1987, where I developed digital image processing algorithms to improve image and stereo-matching quality for a digital terrain modeling system, including software and algorithms for affine transformation, edge filtering, kriging interpolation, and image stereo-matching with sub-pixel acuity. I continued my work with digital image processing as a Research Associate at the University of Maryland, from June 1987 to September 1988. During my time at the University of Maryland, I designed algorithms for filtering, segmenting, clustering, and path planning based on digital images organized by quad-tree data structures.

6. From September 1988 to June 1994, I worked as a Senior Systems Engineer for the Hughes STX Corporation. As part of my work, I developed methods for comparison of sky maps from the Cosmic Background Explorer (COBE) mission with sky maps from other missions based on scientific data stored in a spatially-referenced database using a quad-tree data structure. In this role, I led the Systems Engineering and end-to-end development of a novel system for compressing imaging and ancillary data that combined scientific modeling with statistical data compression. I was also charged with designing and developing evaluation tools to ensure user-transparent, system-wide compression of a 380-GB dynamic database at an image quality acceptable to end-user scientists. In recognition of my work, I received a Hughes STX Achievement Award in 1990 and 1992.

7. After June 1994, I began a six-month stint as a contract Software Engineer for the Federal National Mortgage Association in Washington D.C., for which I developed a graphical user interface to monitor and validate loan servicer input for a Loss Mitigation Project. I then served as an Independent Consultant to Optivision, Inc. for the next six months, where I researched and developed rate control algorithms and software based on the MPEG-2 Test Model 5 for the OPTIVideo™ MPEG-2 video encoder, as well as adaptive quantization algorithms based on the then-JPEG-3 draft standard. In this role, I researched and developed algorithms to improve the quality of gray scale image compression for the medical

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