EXHIBIT C

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF WASHINGTON
SEATTLE DIVISION

CYWEE GROUP LTD., *Plaintiff,* HTC CORPORATION and HTC AMERICA, INC., *Defendants.*	CASE NO. 2:17-cv-00932 JURY TRIAL DEMANDED

DECLARATION OF NICHOLAS GANS, PH.D.

I, Nicholas Gans, Ph.D., hereby declare as follows:

1. I have been asked by counsel for Plaintiff CyWee Group Ltd. ("CyWee") to offer information and my opinions as to the technologies disclosed in U.S. Patent No. 8,441,438 (the "'438 patent") and U.S. Patent No. 8,552,978 (the "'978 Patent").

2. In connection with the preparation of this Declaration, I have reviewed the materials listed below:

- The '438 patent;
- The file wrapper for the '438 patent;
- The '978 patent; and
- The file wrapper for the '978 patent.

3. All of the opinions stated in this declaration are based on my personal knowledge and professional judgment. If called as a witness, I am prepared to testify competently about them.

I. EXPERIENCE AND QUALIFICATIONS

4. I am a Clinical Associate Professor with the Department of Electrical Engineering at the University of Texas at Dallas.

5. I received my doctorate in Systems and Entrepreneurial Engineering from the University of Illinois at Urbana-Champaign, with dissertation research in the fields of robotics, controls, and estimation. I continue to research and teach these topics in my capacity as a Professor, with over 100 peer reviewed publications and three patents. I have authored multiple papers on the topic of Inertial Measurement Units and related sensors and fusion algorithms.

6. A more complete list of my qualifications is set forth in my curriculum vitae, a copy of which is attached hereto as Exhibit A.

7. I am being compensated for work in this matter. My compensation in no way depends on the outcome of this litigation, nor do I have a personal interest in the outcome of this litigation.

II. NATURE OF THE DISCLOSED TECHNOLOGIES

8. The ’438 patent and ’978 patent disclose devices and methods for tracking the motion of a device in 3D space and compensating for accumulated errors. That is, at a high level, the patented inventions teach how to determine a device’s current orientation based on motion data detected by its motion sensors, such as an accelerometer, gyroscope, and magnetometer.

9. There are different types of motion sensors, including accelerometers, gyroscopes, and magnetometers. Accelerometers measure accelerations. For example, airbags use accelerometers, such that the airbag is triggered based on sudden deceleration. Accelerometers can also measure forces due to gravity. Gyroscopes measure rotation rates or angular velocities. Magnetometers measure magnetism, including the strength of a magnetic field along a particular

direction. Each type of motion sensor is subject to inaccuracies. For example, a gyroscope sensor has a small, added offset or bias. This bias will accumulate over time and lead to large drift error. Similarly, magnetometers are subject to interference from natural and manmade sources (e.g. power electronics). Additionally, errors can accumulate over time. These sensors typically take measurements along a single direction. To accurately measure motions along an arbitrary axis, three like sensors are grouped together and aligned at right angles. Such a sensor set is generally referred to as a 3-axis sensor.

10. To incorporate the data from multiple sensors and compensate for the errors described above, the ’438 patent and ’978 patent each disclose a sensor fusion technology. Specifically, the ’438 patent discloses an enhanced sensor fusion technology and application for calculating orientation (including tilting angles along all three spatial axes) by using measurements from both a 3-axis accelerometer and a 3-axis gyroscope; furthermore, it can correct or eliminate errors associated with the motion sensors. This technology is especially suited for accurately representing a mobile device’s orientation in 3D space on a 2D display screen by mapping the yaw, pitch, and roll angles relating to movement along the three spatial axes to a 2D display reference frame. Simply put, the ’438 patent discloses an improved system and method to capture motion of the device and for eliminating or correcting errors based on movements and rotations of the device.

11. Likewise, the ’978 patent discloses a similar enhanced sensor fusion technology for calculating orientation. Unlike the ’438 patent, which discloses and claims using two motion sensors—an accelerometer and gyroscope—the ’978 patent discloses and claims using a third sensor—a magnetometer.

12. Orientation information returned by the claimed inventions of the ’438 and ’978 patents has many uses, particularly for mobile cellular devices, such as navigation, gaming, and augmented/virtual reality applications. Navigation applications can use orientation information to determine the heading of the phone, indicate what direction the user is facing, and automatically

orient the map to align with the cardinal directions. Increasing numbers of games and other applications use the motion of the phone to input commands, such as tilting the mobile device like a steering wheel. Augmented and virtual reality applications rely on accurate estimation of the device orientation in order to render graphics and images at the proper locations on the screen.

III. OPINION REGARDING ADVANTAGES OVER PRIOR ART

13. In the past, motion sensors had limited applicability to handheld pointing devices due to a variety of technological hurdles. For example, different types of acceleration (*e.g.*, linear, centrifugal, gravitational) could not be readily distinguished from one another, and rapid, dynamic, and unexpected movements caused significant errors and inaccuracies. These difficulties were compounded by the miniaturization of the sensors necessary to incorporate them in handheld devices. With the development of micro-electromechanical systems, or "MEMS," miniaturized motion sensors could be manufactured and incorporated on a semiconductor chip, but such MEMS sensors had significant limitations.

14. For example, it is impossible for MEMS accelerometers to distinguish different types of acceleration (*e.g.*, linear, centrifugal, gravitational). When a MEMS accelerometer is used to estimate orientation, it must measure force along the direction of gravity (*i.e.*, down), but that gravitational measurement can be "interfused" with other accelerations and forces (*e.g.*, vibration or movement by the person holding the device). Thus, non-gravitational accelerations and forces must be estimated and subtracted from the MEMS accelerometer measurement to yield an accurate result. A MEMS gyroscope is prone to drift, which will accumulate increasing errors over time if not corrected by another sensor or recalibrated. A MEMS magnetometer is highly sensitive to not only the earth's magnetic fields, but other sources of magnetism (*e.g.*, power lines and transformers) and can thereby suffer inaccuracies from environmental sources of interference that vary both in existence and intensity from location to location.

15. Additionally, orientation cannot be accurately calculated using only one type of

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