

# A Trends Analysis of Dinghy Yacht Simulator

Jae-Neung Lee, Sung-Bum Pan, Keun-Chang Kwak

**Abstract**—This paper describes an analysis of Yacht Simulator international trends and also explains about Yacht. The results are summarized as follows. Attached to the cockpit are sensors that feed -back information on rudder angle, boat heel angle and mainsheet tension to the computer. Energy expenditure of the sailor measure indirectly using expired gas analysis for the measurement of VO<sub>2</sub> and VCO<sub>2</sub>. At sea course configurations and wind conditions can be preset to suit any level of sailor from complete beginner to advanced sailor.

**Keywords**—Trends Analysis, Yacht Simulator, Sailing.

## I. INTRODUCTION

THE best way of thinking of the word ‘Simulator’ is indoor golf simulator. The market of indoor golf simulators has shown rapid growth with the increasing number of golf players. There are about 8000 indoor golf simulators in Korea and over 4000 of them are concentrated in Seoul, which is the capital of Korea. According to the Fair Trade Commission, there are 7836 indoor golf simulators (estimated in 2012), it increased about 4.7 times compared to that of 2007 (1684). Also the visitors of indoor golf simulators were estimated about 1.86 million people in 2012. The rapid growth of the indoor golf simulator market is attributed to absurdly insufficient golf infrastructure compared to the soaring golf population. The advantage of enjoying golf without sparing lots of time to go to a far golf course can also be a reason that contributed to the increasing number of the indoor golf simulators. In this light, many sports simulators are under development such as horse riding, skiing, boarding, kayaking, yachting, bobsleighing, cycling and hang gliding. Early sports simulators had their limit offering fun as they were games focusing on simple copying. However, they are developing into more realistic games for which the players have to consider visual effect, actual feeling and interaction as their demands are increasing. The simulators can motivate the learners as they comprise interesting training environment, engage the players, which naturally leads to good quality training and be played regardless of the weather and time as they are indoor sports activities. For example, the simulators do not need management while real horses do. However, their programs are routinely repeated offering less diverse environment and the emphasis can be put to winning over training with the risk of competition. Therefore, it is important to design them to help the users achieve their training goals and give immediate feedback when the goals are fulfilled. The training outcome could be bad if the user ends up losing interest in them. For instance, the riders can communicate and interact with the horse while they cannot with the simulators.

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The paper analyzes the trend of yacht simulator among many of its kind [1]-[3].

## II. A TRENDS ANALYSIS OF YACHT

### A. Yacht

A yacht is a recreational boat or ship. The term originated from the Dutch Jacht meaning "hunt". It was originally defined as a light fast sailing vessel used by the Dutch navy to pursue pirates and other transgressors around and into the shallow waters of the Low Countries. After its selection by Charles II of England as the vessel to carry him to Britain from Holland for his restoration in 1660, it came to be used to mean a vessel used to convey important persons.

In modern use of the term designates two rather different classes of watercraft, sailing and power boats. Yachts differ from working ships mainly by their leisure purpose, and it was not until the rise of the steamboat and other types of powerboat that sailing vessels in general came to be perceived as luxury, or recreational vessels. Later the term came to encompass motor boats for primarily private pleasure purposes as well. Yacht lengths generally range from 12 meters (39 ft) up to dozens of meters (hundreds of feet). A luxury craft smaller than 12 meters (39 ft) is more commonly called a cabin cruiser or simply a cruiser. A superyacht generally refers to any yacht (sail or power) above 24 m (79 ft) and a mega yacht generally refers to any yacht over 50 meters (164 ft). This size is small in relation to typical cruise liners and oil tankers.

Modern yachts have efficient sail-plans, most notably the Bermuda rig, that allows them to sail towards the wind. This capability is the result of a sail-plan and hull design. Fig. 1 shows Sailing Yacht [4].

### B. Yacht Simulators

It's a technical piece of kit - the VS-C1 sailing simulator is the cockpit of a racing dinghy that pivots on an A-frame. The angle of heel is controlled by a pneumatic ram that is controlled by a computer buried within the frame. Attached to the cockpit are sensors that feed-back information on rudder angle, boat heel angle and mainsheet tension to the computer. As a sailor you can sail one of a variety of boats including a Laser (4,7, Radial or full rig), a Byte, 29er, or an Optimist. Indoor sailing is based in Lymington on the UK south coast. Fig. 2 shows VS-C1's yacht simulator [5].

Energy expenditure of the sailor will be measured indirectly using expired gas analysis for the measurement of VO<sub>2</sub> and VCO<sub>2</sub>, at rest and during the simulated sailing task, to determine the energy cost of the work being performed under the simulated conditions, and the relative energy efficiency of the sailor in a variety of sailing positions. Other physiological measurements including heart rate and blood lactate

concentrations will also be measured throughout the task as additional indicators of the energy cost of the activity. These methods will provide measurements of the energy input. Fig. 3 shows Australia's yacht simulator [6].



Fig. 1 Sailing Yacht



Fig. 2 VS-C1's Yacht Simulator



Fig. 3 Australia's Yacht Simulator



Fig. 4 Vsail's Yacht Simulator

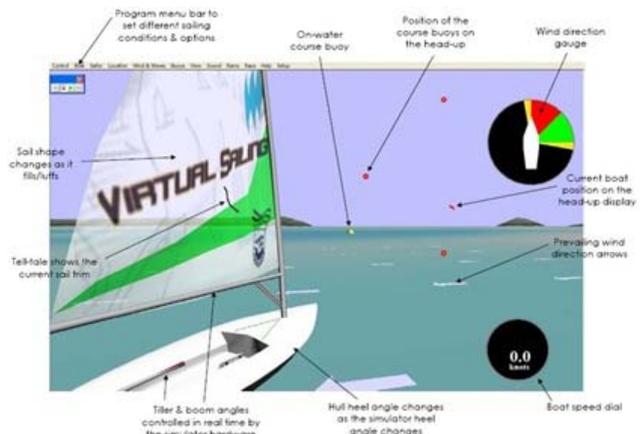


Fig. 5 Vsail's Screen of Yacht Simulator

Real time controls are available like a sail boat with a tiller for steering, a mainsheet for sail control and to apply body weight for controlling the heel angle by the sailors. At sea course configurations and wind conditions can be preset to suit any level of sailor from complete beginner to advanced sailor.

An optional “Access Unit” inside the cockpit helps the simulator to be controlled by either a mechanical joystick or an electronic joystick depending on the ability of the sailor. Fig. 4 shows Vsail’s Yacht Simulator and Fig. 5 shows Vsail’s Screen of Yacht Simulator [7].

The stable, solid, safe cradle ensures great adaptability for housing all classic sailboats: Optimist, Laser, RS, Equipe etc. Easily and quickly assembled without the need for special tools and entirely realised in painted steel to prevent corrosion from water and humidity over time. Four castor wheels make SAILING MAKER particularly safe and easy to manoeuvre, even with a full load. An industrial, low absorption fan positioned in front of the cradle modulates the right amount of air to create the best conditions for practising manoeuvres before attempting to do so on the water. Fig. 6 shows sailing maker’s yacht simulator [8].



Fig. 6 Sailing Maker’s Yacht Simulator



Fig. 7 Laser Coach’s Yacht Simulator

The user receives feedback from the visual representation of where the dinghy is relative to the wind and course, as well as feedback from the simulator in the form of rudder forces, mainsheet tension, heel moment and angle. It is then up to the user to balance these forces and moments.

As the forces and moments are applied via pneumatic rams and a spring, the feel of this real force balance is quite realistic.

The simulator then takes the results of these real force balances through linear and potentiometer transducers and feeds them into the computer. The computer then carries out the bulk of the simulation, based on a relatively simple velocity prediction model. This numerical approach then yields a new dinghy position, which is fed back to the visual representation, and a new heel moment and rudder force, fed back to the simulator. Fig. 7 shows laser coach’s yacht simulator and Fig. 8 shows laser coach’s yacht simulator structure [9].

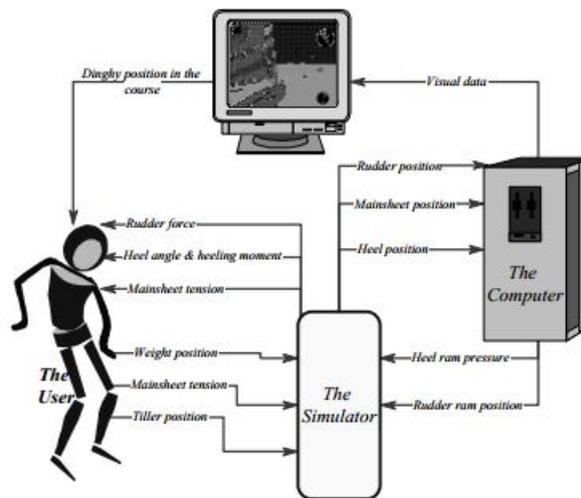


Fig. 8 Laser Coach’s Yacht Simulator structure



Fig. 9 InnoSportLab’s Yacht Simulator

InnoSportLab’s virtual reality software tracks a vast range of physical responses to such things as rudder pressure, trimming actions and sheet tensions. Performance data can be read in real time. The simulator also stores complete race records that can be re-run later. The sail simulator is a product of Stentec Software BV and Delft University of Technology. The center runs several other hi-tech research projects in service of Dutch

sailing talents, such as a high-tech coaching RIB that transmits a sailboat's behavior on the water in real time to shore. Fig. 9 shows innosportlab's yacht simulator [10].

The unit's gymnasium is full of exercise equipment designed for spinal patients but none gets them as enthused as this latest piece of technology. Patients are hoisted into the machine which operates by hydraulics. They use a joystick and ropes to navigate courses on a television screen. The machine tips and turns at angles simulating the movements of a yacht. The simulator is a fun workout for patients and helps them regain strength and learn to sail. They can select different types of boats, wind gusts and strengths, different courses around the world and competitors on the virtual course. Fig. 10 shows Jan's Yacht simulator [11].



Fig. 10 Jan's Yacht Simulator



Fig. 11 Victoria's Yacht Simulator

Yachting Victoria's strategic objective for coaching is to increase the success of competitive sailors by ensuring the availability of coaching services for sailors wanting to improve their performance, skills and results by the, Development and support of qualified coaches, Development and support of coaching programs at clubs and recognized classes, Support coaching programs for those top competitive sailors with potential to make the Australian Sailing Team and Australian Sailing Development Squad, Provide well understood and excellent pathways for skills development for competitive sailors and coaches.

The aim of Yachting Victoria's Coaching Strategy is to increase the success of competitive sailors by providing; clear pathways for competitive sailors, in terms of skills and equipment, support a framework for club and recognized class coaching programs, qualification and professional development for coaches, an annual major regatta calendar to increase competitive fleet experience, a high performance coaching program for sailors with the potential to be selected for Yachting Australia's ASDS and AST. Fig. 11 shows Victoria's yacht simulator [12].

### III. CONCLUSION

The yacht simulator trend presented that it is developed in the way to sail the navigational course in the user interface by receiving data on rudder or mainsail that the user can control in the real yachting environment, under which rudder, mainsail, center board, sail trim and boat balance need adjustment depending on wind velocity and wind direction. On the contrary, many components were found insufficient on the simulator. In this context, substantial development will be realized if rudder, mainsail, center board, sail trim and boat balance on the simulator are adjusted under arbitrary wind speed and direction of the simulator and saved as database.

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