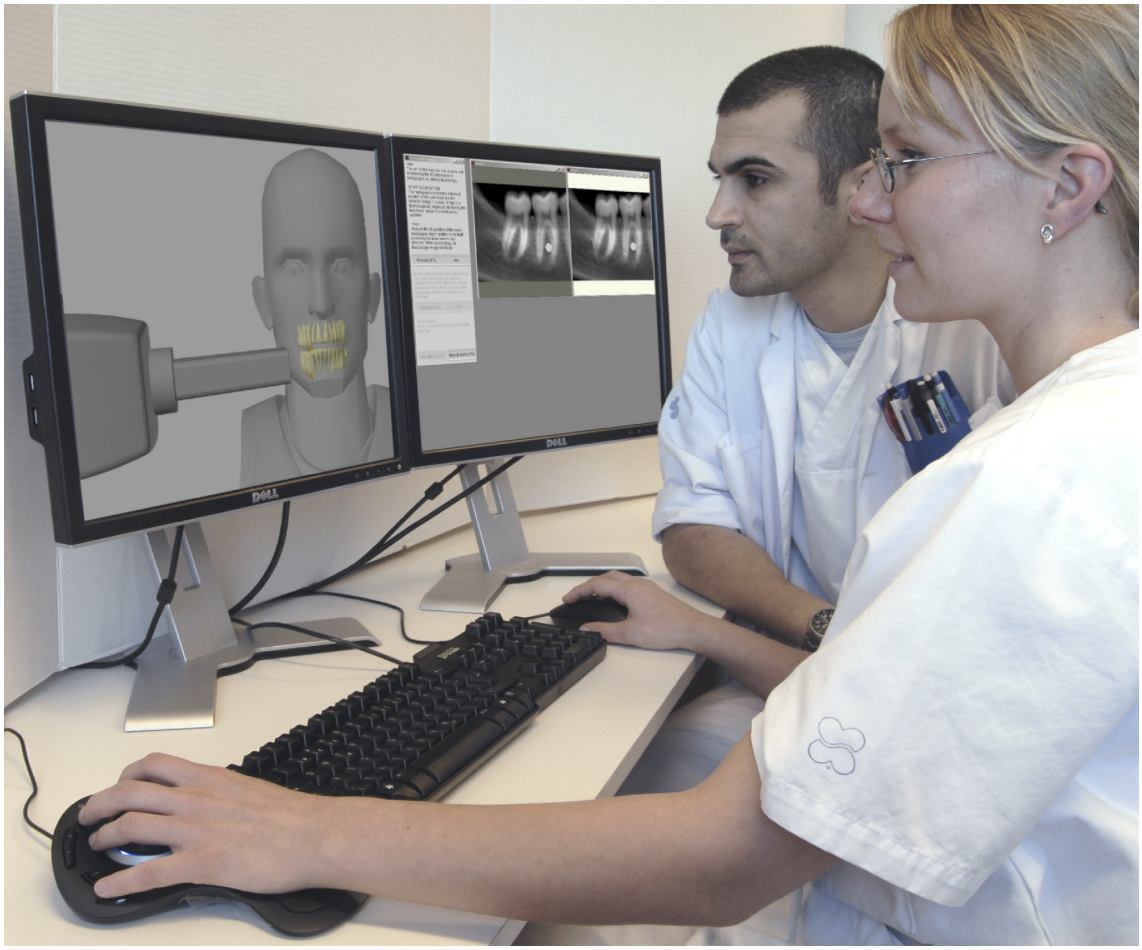
QBION ORAL RADIOLOGY PACKAGE



User manual
GENERAL INFORMATION

Contents

Introduction

The Qbion Oral Radiology Package (QORP) is a learning tool which allows the user to perform and analyse virtual oral radiology examinations with no ionising radiation used. This manual describes the programs in QORP from a user perspective. Technical aspects of QORP are described in the Technical manual.

A radiology simulator consists of hardware and software. The hardware is comprised of a standard PC with two monitors and standard PC accessories. The radiology simulator is not restricted to use only for radiology simulation, but can also be used with any other applications normally used on PC's.

Virtual Environment

The software is a Virtual Reality (VR) application. This means that the user is presented with a Virtual Environment (VE) in which it is possible to navigate and interact. The VE presents a scene with three main objects, a patient, an x-ray tube head, and a detector. With the help of interaction tools the user can navigate in the scene and view it from any perspective. It is also possible to interact with separate objects in the scene, for example the user can grab the x-ray tube head or the detector and move it to any desired position.

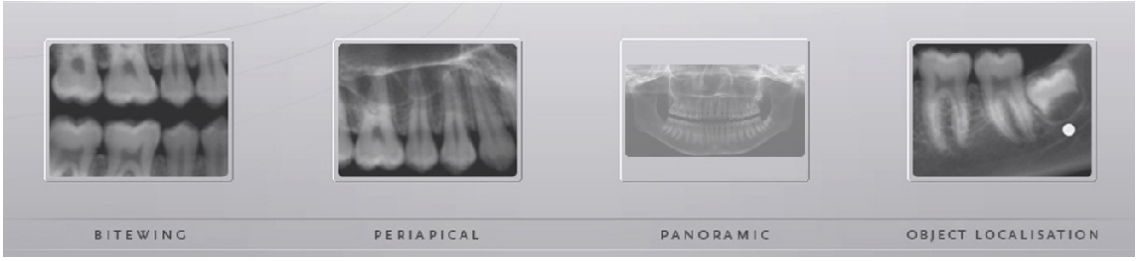
The patient model is made up of a transparent torso where the tooth arches with complete teeth (including the roots) are visualised. The patient model actually consists of two parts, one invisible and one visible. The invisible part is a high resolution computed tomography (CT) radiology examination data matrix of a dry skull, and the visible part is a polygon model of tooth arches rendered from the actual CT-data.

Using the interaction tools the user can position the x-ray machine and detector in any desired position relative to the patient. The software makes a radiographic projection through the CT data matrix on the detector plane and renders a geometrically correct radiographic image from the individual positions of the x-ray machine and detector.

Programs

The aim of the simulator programs is to provide a tool that facilitates understanding of the principles of radiographic imaging. A thorough understanding of radiographic projection geometry is essential for high quality radiographic imaging and interpretation which in turn is a necessary prerequisite for radiographic diagnosis. With a solid understanding of radiographic projection geometry, the user is better prepared to solve problems that emerge during radiographic imaging of patients.

The philosophy behind QORP has its base in constructivist learning theories. According to DA Kolb 1984 'Learning is the process whereby knowledge is created through the transformation of experience'. The QOPR programs are therefore designed to encourage the users to use the simulator for experimentation and analysis. The advantage with radiology simulation is that no ionising radiation is used and the users can experiment, and gain experience that otherwise would take much longer to acquire.



QORP consists of four separate programs. The programs are: Bite-wing, Periapical, Panoramic, and Object localisation.

Editions and modules

The Standard edition of each program is organised into two main modules; "Interaction training" and "Skill training". In the Extended edition an "Examination" module is added.

The aim with the Interaction training module is to acquire the skills necessary for navigation in and interaction with the VE. For beginners it is therefore highly recommended that the Interaction training exercises be done before starting the actual Skill training. The exercises are designed for learning the interaction technique in the actual Skill training module. If interaction training is neglected, the value of the training program can be jeopardised.

The Skill training module offers exercises designed to perform radiographic examinations and exercises based on analysis and interpretation of high-quality as well as poor radiographic examinations. The exercises are designed as step-wise procedures towards defined goals supplemented with clear feedback.

The Examination module is designed to automatically and objectively evaluate the user's knowledge and understanding of the topic trained on in the skill training module. An administration tool for recording the individual users' performance is included in the Examination module.

In all exercises each task is randomly generated which guarantees an indefinite number of new tasks.

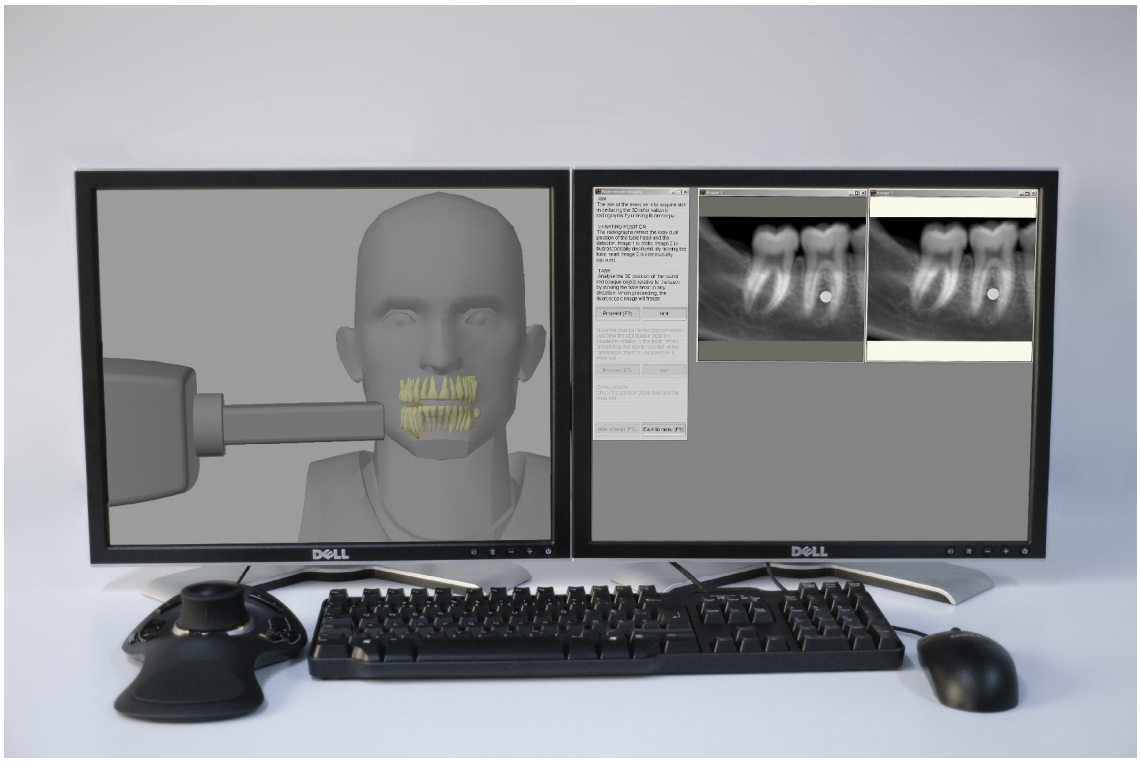
User interface components

Recommended configuration

The Qbion Oral Radiology Simulator can be configured in a number of ways depending on need. These instructions are valid for the recommended set-up.

From a user perspective the standard configuration has the following components:

- a PC computer
- two monitors
- a 3D-mouse for navigation in the VE, and
- a 3-button mouse for interaction with separate objects in the VE.



In the default set-up the VE is presented on the left-hand monitor; instructions, rendered radiographs, and feedback are presented on the right monitor. It is recommended that the dominant hand (most often the right hand) operate the conventional mouse while the contra-lateral hand simultaneously operates the 3D-mouse.

Navigation in the VE

The scene can be viewed from any desired direction by the help of navigation tools. The viewing direction is changed by rotating the scene and by movements up/down and sideways (translation).

Navigation can be performed in three various ways; with keyboard keys only, with conventional mouse in combination with keyboard keys, and with a 3D-mouse. A 3D-mouse is a powerful navigation tool but requires some training for smooth functioning.

Navigation with keyboard keys only

Rotation

Press the **Arrow** keys for rotation around a horizontal and a vertical axis.

Up/down arrows: Rotation around a horizontal axis.

Left/right arrows: Rotation around a vertical axis

Translation

CTRL + Arrow keys move the scene up/down and sideways.

Up/down arrows: Translation up/down.

Left/right arrows: Translation sideways.

Press the **Page Down/Page Up** keys for changing scene distance.

Page Down key: Moves the scene closer

Page Up key: Moves the scene more distant

Navigation with conventional mouse in combination with keyboard keys

Rotation

CTRL + left mouse button makes the scene rotate around a horizontal and a vertical axis.

Up/down movement: Rotation around a horizontal axis.

Sideways movement: Rotation around a vertical axis.

Translation

CTRL + right mouse button moves the scene up/down and sideways.

Up/down movement: Translation up/down.

Sideways movement: Translation sideways.

CTRL + middle button (press the wheel, don't roll it) moves the scene closer or more distant

Up/down movement: Moves the scene more distant/closer

Sideways movement: No function

Navigation with 3D mouse

Rotation and translation is performed with one tool.

With the hand on the 3D mouse imagine your hand on the patient's head. Rotate the 3D mouse clock-wise and the scene will rotate clock-wise. Push the 3D mouse down and the scene will be pushed down-wards. Pull the 3D mouse closer to you and the scene will move closer. With a little training it is possible to rotate and translate the scene in any direction. The 3D mouse is a powerful tool for navigation in the VE. The 3D-mouse has at least two buttons (depending on the model). The button numbers can vary depending on the 3D-mouse model and the programming of the buttons. See technical manual and 3D-mouse manual.

Examples of 3D mice from 3Dconnection™.

Interaction with separate objects in the scene

The conventional mouse is used for movement of separate objects in the scene.

- Left button: rotation of object
- Right button: movement sideways and up and down in relation to the viewer.
- Central button: movement towards and away from the viewer.

Interaction training

The aim with the interaction training module is to acquire skills to navigate in and interact with the VE. The exercises are designed for the achievement of interaction skills necessary for successful performance of the exercises in the skill training module.

It is highly recommended that the exercises in the interaction training module be performed before entering the skill training module.

Repeat the exercises as many times as is needed until you can easily control the tools for navigation and interaction!

The effect of skill training will be jeopardised if interaction training is neglected.