Virtual Reality Dojo:

Technique Standardization and Assessment Simulator

OTED 795

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The Virtual Reality Dojo:

Technique Standardization and Assessment Simulator

Course Description

This course is designed to augment the typical group instruction practiced at the karate studio by infusing technology-based training at critical points in the training cycle. In the new course, all new students (white belts) receive five private introductory lessons. The main purpose of these lessons is to familiarize the student with the terminology, the basic white belt material, and to define the expected behavior while in the studio. Material refers to all the subject matter required for a specific belt, e.g., sidekick, wide horse stance, rear hand ridge hand. The introductory lessons do not focus on perfecting the material.

Upon completion of the introductory lessons, students will view a series of four, half-hour long videos on different belt specific subjects (hand techniques, blocks, footwork, and kicks). Each video is designed to demonstrate the detailed steps required by each individual requisite technique. For example, a black belt instructor schooled in the Joe Lewis System would demonstrate the sidekick in a step by step process, identifying the proper method and commonly made mistakes. See Table 1 for a sample script.
Step | Procedure
--- | ---
1 | From the fighting stance, slide toes of rear foot up to heal of front foot.
2 | Lift and fold front leg to your side. Leg should be parallel to the ground and heel on your buttocks. Heel and buttocks should be pointed toward opponent.
3 | As you shoot folded leg straight out, rotate rear foot to the back. Strike with the heel of your foot.
4 | Retract extended leg to original folded position.
5 | Lower folded leg to the ground, placing it in the proper fighting stance position.

| Note: | At all times during sidekick, ensure hands are in the proper position for the fighting stance as defined in the Joe Lewis System Karate Manual.

Table 1. Sidekick Video Script

To test for a yellow belt, a student must have a minimum of thirty-five hours (lessons). The videos must be viewed prior to the fifteenth lesson. At this point, the student is assessed on the basic techniques contained on the videos by a black belt instructor. If the student has not viewed all the videos, they can not accrue any more hours toward the minimum required hours until all four videos are viewed.

The assessment is conducted using a checklist developed from the steps contained in the video scripts. Passing the checklist assessment by the black belt instructor is required prior to proceeding to the next phase of group instruction --fighting routines and kumite (sparring). A maximum of one 'no' response on three or fewer checklists is required for passing. See Table 2 for a sample checklist.
<table>
<thead>
<tr>
<th>Technique</th>
<th>YES/NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper fighting stance.</td>
<td></td>
</tr>
<tr>
<td>Slides up toe to heel.</td>
<td></td>
</tr>
<tr>
<td>Folds leg properly. (Parallel to ground, heal/buttocks towards target)</td>
<td></td>
</tr>
<tr>
<td>Executes kick properly. (Extends, strikes with heel, retracts prior to laying down)</td>
<td></td>
</tr>
<tr>
<td>Hands in proper position for fighting stance. (Elbows in, closed fist, feet at 12 and 5 o'clock, rear heel off ground 1 to 3 inches)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Sample Checklist

A failing grade on the assessment requires the student to complete a minimum of five additional lessons and view video(s) relevant to their weaknesses prior to a reassessment. Passing students view a forty-five minute video on the fighting routine basics prior to proceeding to the group instruction on fighting routines and point sparring. Fighting routines, a compilation of three to five hand techniques and kicks, utilize various footwork and blocks. In American style karate, the fighting routine has replaced the kata of the traditional style karate. The fighting routine video follows the same structure as the video on basic techniques.

After a minimum of fifteen lessons in fighting routines, students arrange for a virtual reality assessment of their fighting routines and point sparring. The virtual reality assessment simulator produces a graded checklist for the fighting routines similar to the instructor assessment checklist. The virtual point sparring is judged according to IFA
regulations. The checklist and point sparring Pass/Fail criteria will be discussed in the simulation description section.

Prior to reassessment by the virtual reality simulator, failing students receive several one-on-one lessons covering the items they failed. Students passing the simulation are grouped with other students waiting for the next belt test date. Test dates are approximately three weeks apart. During each class prior to the test date, one instructor works solely with this group, refining each student's techniques and fighting routines. The week prior to the test, the head black belt instructor reviews the material individually with each student, determining whether to recommend them for testing. The recommendation of the head black belt instructor is necessary prior to testing.

**Course Justification**

Instruction at the karate studio is either the entire class or smaller groups of three to six students. There is very limited one-on-one instruction. From the basic stances, hand techniques, blocks, and kicks to the more advanced fighting routines and wazas, instruction is typically not individualized. On the rare occasion when very few students attend, you will receive individual instruction. The only sure way to get one-on-one instruction is by taking private lessons at a cost of thirty-five dollars an hour. Individual instruction is critical to learning the finer points of the techniques. Learning the techniques improperly as a beginner has a downstream effect. The techniques for each belt builds on the material required for the previous belt. Early refinement of the technique can eliminate possible problems later.
The need for the student to receive feedback on their progress and to be able to review the way to properly execute a technique in the absence of an instructor provide the basis for the justification of this course. The videos provide the students the ability to review the material at any time. The virtual reality simulator allows the students to practice their material and receive feedback on their progress. The students can chart their progress and work on their weaknesses using the results from the simulator.

In martial arts there are many different disciplines with numerous styles. The black belt instructors at most karate studios did not learn their style of martial arts from the studio where they are teaching. This course proposal was developed for an American-style Karate studio. The staff at the American-style studio is comprised of instructors who may have studied kali silat, tae kwon do, arnis de mano, or traditional karate to name a few. Depending on the style studied, each instructor may have slight variations to the karate stances, hand techniques, blocks, and kicks. These equally effective variations are passed on to the students. The variations are usually not caught until test day when it is too late. During the belt test, a technique executed with a variation from the Joe Lewis System is counted as wrong. The technology-based portions of this course can provide the secondary benefit of standardization of instruction.

The students and the instructors will both know what is expected. In addition, the students are provided by this course the ability on how to perfect their technique. Without
the infusion of technology provided by this course, there would be no means to provide the essential standardization and assessment required by the students.

**Target Audience:**

The course is designed for white belt students studying to become a yellow belt. The white/yellow material covered in the course forms the foundation for all succeeding belts. The virtual reality simulator has an offensive posture, defensive posture, and point sparring mode with selectable opponents based on belt designation. This allows a student to practice against an advanced opponent. This feature would provide the means for more advanced belts to use the simulator. The students range in age from four to sixty years old. The students vary by gender, physical ability, socioeconomic status, and motivation. In essence, there is not a typical profile of a karate student.

The primary intended audience for this course is the white belt students studying for their yellow belt. A possible secondary audience is all other students in need of a method to refine their technique based on the Joe Lewis System. In addition, some instructors may utilize the technology to aid in their group instruction. The possibility exists for the virtual karate environment simulator to be programmed to deal with the other belt levels.

**Justification for Using TBT:**

The typical student to instructor ratio is approximately five to one. On the average, classes encompass five different belt classifications, resulting in a wide
spectrum of experience. This multiple belt class composition results in studying execution of techniques common to all belts. The time spent on working on material required for a specific belt is limited. This environment creates two shortfalls in the area of instruction. First, each instructor has slight variations of techniques acquired from the school where they received their black belt. These variations can have a deleterious effect on a student when they test for their belt. Secondly, the ability of the instructor to adequately assess the belt related technique and fighting routines of each student individually is limited. The instructor can spend a minimal amount of time with any one student. The class instruction is not sufficient in enabling a student to perfect the material necessary to progress to the next belt classification.

The student needs to know what they are expected to learn and be provided the means to perfect it. The best method to achieving these goals would be by taking private lessons from an instructor schooled in the Joe Lewis System. This method is not possible for the vast majority of students taking karate. To help ameliorate this problem we must rely on technology-based training. The video portion of the course provides the student and instructor with the same frame of reference on how execute the techniques based on the Joe Lewis System. At any point in course the student can refer back to the video for clarification of a specific technique. The current situation at the studio requires the student to try to get the question resolved with the head black belt instructor-- the only one at the studio formerly schooled in the Joe Lewis System. Technology provides the requisite standardization otherwise impossible in the current instructor-based training.
A second benefit of using technology is the ability for the student to be objectively assessed and provided a method to practice their material at their convenience. The current procedure at the studio is to assess the students when they have completed at least twenty-five hours toward the thirty-five hour minimum. Improper techniques may have already been learned. The head black belt instructor does not always conduct the assessment. This can result in improper techniques being inadvertently overlooked. Technology provides the standardization to the material taught and increases the impact the student has on ensuring their success.

**Description of the Simulation:**

Representative of the karate studio, the simulation portion of the course is a virtual karate environment containing several modes of operation. The actual room is 16' by 16' with a 12' by 12' sparring ring outlined on the floor. The sparring room outline is for non-virtual reality practice. The student wears a gee with wireless transmitters located at the shoulders, elbows, wrists, hips, knees, and ankles. The transmitters send X, Y, and Z coordinates for each joint location, providing a three dimensional representation of the student in relation to time and space. A specially designed sparring headgear is outfitted with the virtual reality projection system. The student wears sparring kicks and punches rigged with sensors and wireless transmitters to determine foot and hand orientation. With many of the kicks and hand techniques, the correct position and orientation of the feet and hands is required to achieve a passing mark.
Prior to utilizing the virtual reality simulator, the system must be calibrated for the student's range of motion, speed, and reflex, creating an individual student profile. All students are not professional athletes. Some students can do the Chinese splits while others may have less than ninety degrees of flexibility. This must be taken into account during assessment. It would not be fair to expect a recently retired fifty-eight year old truck driver to have the same flexibility and physical endurance as an eighteen year old gymnast. Calibration of the system begins with the student executing a series of joint rotation exercises, punches, kicks, and blocks. Age, weight, and height are additional factors taken into consideration when developing the student profile for the simulator.

Upon completion of the calibration phase, the student chooses one of the four possible virtual karate environment modes. All of the modes can be operated in demo, guided, monitored, or test. The first mode is the fighting routine assessment. This mode of operation assesses the student on the seven required yellow belt fighting routines. This mode has two assessment options: 1) Instructor Assessment, and 2) Personal Assessment. The Instructor Assessment is utilized in determining fitness for belt testing and evaluating the fighting routine learning objectives. Passing this assessment allows the student to proceed to the semi-private group instruction -- the final phase of instruction prior to the belt test. The Personal Assessment is designed to allow the student to refine their fighting routine techniques, receiving feedback on strengths, weaknesses, and marginal areas. Included in the printed assessment are suggestions on how to improve on your weak areas. Each student's assessment sessions are documented and tracked, providing the
student with a history of their progress. After each assessment, the student has a
debriefing session with an instructor to review the results of the simulation.

The second virtual environment mode is the Kumite/Point Sparring Mode. The
student selects the belt level of opponent, number of points to win, and number of
matches. Points are awarded based on the AAU point system. Briefly, points are awarded
for strikes to the area of the torso above the belt and below the shoulders, the top and side
of the head, and the lower back (kidney area). Contestants must remain in bounds
indicated by the outline on the floor. Warnings are given for low blows, excessive force
to the head, and leaving the ring. A point is awarded to the opponent on the second
infraction.

The simulator can be programmed to be susceptible to any of the fighting
routines, kicks, or punches. This allows the student to practice their belt material. The
reason for including sparring in the simulator is in preparation for the second phase of the
belt test. The first phase of the belt test is a demonstration of all the material relevant to
the belt. Upon passing the first phase, the students are required to spar several three-
minute matches with different black belt instructors. The criteria for passing phase two is
by not giving up. All students have had matches prior to their belt test. Typically, Friday
night is scheduled as fight night. The difference between the simulator and the other
matches is the Friday night matches are real. This is not the time to practice one of your
weaker techniques. The simulator allows the student to feel the thrill of victory without
having to experience the agony of defeat-- a real sidekick to the lower ribs.
The Offensive Mode represents the third simulation mode available to the students. In this mode, the student takes on the role of the aggressor, attacking an opponent programmed to take a predominantly defensive posture—a.k.a. a target. The student can select the level of experience of the virtual opponent. This mode is designed to assess the student’s speed and reflexes. The student can begin to develop certain combination of techniques that they feel comfortable executing and test their effectiveness. The simulator provides the user with a detail report on the effectiveness of their techniques, speed of kicks and hand techniques, and the measure of their reflex to the virtual opponent's countermoves.

In addition, the student can practice isolation drills, utilizing the virtual opponent as a target. An isolation drill is the slow, meticulous execution of typically a single kick or hand technique and combinations of a hand technique and single kick. The goal of an isolation drill is to refine the technique by concentrating on incremental steps. The basic technique learning objectives are evaluated during isolation drill simulator sessions. The output from an isolation drill session is a printed assessment of the basic techniques, including suggestions on how to improve on weak areas. Each student's isolation drill session assessments are documented and tracked, providing the student with a history of his or her progress. After each isolation drill simulation session, the student has a debriefing session with an instructor to review the results of the simulation. The simulator can give immediate audio feedback as the student steps through the technique. For example, if during the execution of the sidekick the student inadvertently drops their rear
hand while executing a forward hand jab-rear leg front kick, the system could remind the student of the proper placement.

The final simulation mode is the Defensive Mode. The student in a defensive posture, waiting for the attacks of the aggressive virtual opponent. The student can select the level of experience of the aggressive virtual opponent. Emphasis in this mode is on the student's proper utilization of blocks and footwork. Primary feedback in this mode is provided to the student by a virtual method. For example, if the student drops their rear hand while in a defensive fighting stance, the virtual opponent will most likely execute a boot to the head. The defensive mode is designed to exploit the weaknesses of the student.

The four modes of the simulator are designed to address the weakness of the typical methods of karate instruction. They are by no means intended to replace the instruction by a black belt, but rather augment the lessons taught by the instructors. The debriefing by the instructor after each use of the simulator is a valuable step in the learning process. The decision to utilize a simulator was aimed at providing the student immediate feedback on their performance. In the area of adult learning, the simulator provides them some desirable control over their learning. With the Nintendo Generation, the simulator provides a means to learn a physically demanding skill in a game-like environment. To their generation, the simulator is nothing more than the newest release of Virtuo-Streetfighter.
**Type of Simulation:**

The virtual karate environment simulation is considered a tactical-decision simulation. According to the text, the task for the participants is to interact with a complex evolving problem or crisis, bringing it to a safe or logical conclusion. The students using the simulator are required to interact with an opponent without being hurt. The focus of the participant in the simulation is the evolving crisis of defending against the aggressor. The adversarial atmosphere of the virtual environment represents the roles of the problems in the simulation. The students' actions required for success are the proper interpretation of their opponents moves, accurate perception of their opponent's intentions, and the expedient development of offensive and defensive strategies. The primary form of feedback in the virtual karate environment simulation is the changes in the nature or status of the problem. In the assessment mode, improvements to a previously problematic technique represent the change in the status of a problem. In the other modes, the primary feedback is by changes in whether the student is winning or losing.

Further refinement in defining the virtual karate environment simulation results in it being classified as a closed structured crisis-management simulation. This determination is based on several representative characteristics of crisis-management simulations. First, the situation presented in several of the virtual karate environment simulation modes can be perceived as a threat to the participants. Secondly, the time available for data gathering and decision-making is severely limited. Finally, the virtual
karate environment simulation has the potential to produce the same feelings and reactions as a similar real life crisis situation.

**Scope of Simulation:**

The simulation is limited to white belt students without restriction. This means there are no age, height, weight, physical ability, gender, karate skill level, or any other factors that will limit the use of the simulation. The yellow belt material as outlined in the Joe Lewis System Handbook defines the limitations of the karate techniques assessed by the simulator. In the point sparring and offensive mode, the opponent's ability is selectable up to black belt as defined in the Joe Lewis System Handbook, providing the student a more challenging scenario.

**Learning Objectives included in simulation:**

The learning objectives fall into three major categories: 1) Basic techniques; 2) Fighting routines; and 3) Point sparring. The basic techniques are executed from the fighting stance starting with either the left or right foot forward. The student slides up executing one of the three hand techniques followed by one of the three possible kicks. See Chart 1 for the eighteen basic techniques learning objectives.
Insert chart one here
An example of a basic technique learning objective from the chart is as follows:

In the Virtual Karate Simulated Environment from a fighting stance with left leg forward, demonstrate a slide up forward hand jab, forward leg round kick according to the Joe Lewis System Karate Handbook with no mistakes.

On the chart, 1.) Represents the conditions of the performance; 2.) Represents the performance; and 3.) Represents the standards of the performance. Selecting the eighteen possible paths through Chart 1 will generate all the basic techniques learning objectives.

There are seven fighting routine learning objectives designed into the virtual karate environment simulator. Proper execution of the seven fighting routines in the simulator, as defined in the Joe Lewis System Handbook, is required prior to proceeding to the belt test. The fighting routines, a combination of hand techniques and kicks, are executed from the fighting stance starting with either the left or right foot forward. See Chart 2 for the seven fighting routine learning objectives.

There is only one point sparring learning objective designed into the virtual karate environment simulator. The student is required to win a minimum of six out of ten five-point matches against a virtual opponent with the belt rank of yellow or better. The virtual point sparring is scored according to the AAU point system. Briefly, points are awarded for strikes to the area of the torso above the belt and below the shoulders, the top and side of the head, and the lower back (kidney area). Contestants must remain in
bounds indicated by the outline on the floor. Warnings are given for low blows, excessive
force to the head, and leaving the ring. A point is awarded to the opponent on the second
infraction.
Insert chart 2 here
Problem/Scenario:

The virtual karate environment simulation provides numerous scenarios for the student. Providing an evaluative environment, the Assessment Mode creates an atmosphere for the student to practice their fighting routines without the pressure and scrutiny of a review from an actual black belt instructor. As a result of essentially a private evaluation, the student gets the necessary feedback without having to interact with an instructor-- sometimes an intimidating experience. A typical assessment scenario would be as follows:

- Student enters virtual karate room and suits up with specially designed gee, punches, kicks, and headgear.
- Simulation operator calibrates the simulator.
- Student selects Personal Assessment on the touch screen.
- Student selects Monitored mode.
- Simulator prompts student to execute the first fighting routine five times.
- Student executes the first fighting routine five times.
- Student's performance is graded and recorded.
- Simulator prompts student to execute the second fighting routine five times and the student execution and grading/recording cycle repeats until all seven routines have been completed.
- Simulator prompts student with choice of continuing with another round of the current selection, a choice of a new simulation mode, or the option to quit.
• Upon selecting quit, the student removes the special gear and leaves virtual karate environment.

• Student receives graded criteria from simulator operator located outside the room.

Utilizing the Point Sparring Mode of the simulator, the next scenario for the student is as a contender in a point sparring match. Changes to the abilities of the opponent create variations to the problem the student will encounter. A typical point sparring scenario would be as follows:

• Student enters virtual karate room and suits up with specially designed gee, punches, kicks, and headgear.

• Simulation operator calibrates the simulator.

• Student selects Point Sparring on the touch screen.

• Student selects Monitored mode.

• Simulator prompts student to bow.

• Upon bowing, simulator states, "Kumite." (Begin to spar)

• When a point is scored, simulator states, "Break."

• Student and virtual opponent return to line.

• Simulator states, "Kumite," and the process continues until someone scores five points.

• Simulator prompts student with choice of continuing with another round of the sparring, a choice of a new simulation mode, or the option to quit.
• Upon selecting quit, the student removes the special gear and leaves virtual karate environment.

• Student receives graded criteria from simulator operator located outside the room.

The Offensive Mode of the simulator puts the student in an environment where the student is the aggressor. For example, the student may be trying to leave a room and someone won't let them out the door. The student is assessed on their ability to safely exit the room. This scenario may not involve the use of karate. The last scenario for the student is created using the Defensive Mode of the simulator. A typical scenario would be the student is walking to their car and attacked by a carjacker. In this scenario, the student is assessed on their ability to defend themselves.

These scenarios are representative of the scenarios a student may encounter utilizing the virtual karate environment. The student arrival, equipment calibration, mode selection process, and grading/recording of performance portions of all scenarios are quite similar. The actions of the student and virtual opponent are the variable portion of the scenario. Using a computer for the virtual karate environment simulation creates the possibility of infinite number of variations.

**Participant Roles:**

Since this course utilizes a closed simulation, the single participant in this simulation is referred to as a student. For the majority of the course their role is that of a
student taking formal instruction in karate. When they are using the virtual karate environment simulation their role changes depending on the mode of operation. See Table 3 for participant roles.

<table>
<thead>
<tr>
<th>MODE</th>
<th>PARTICIPANT ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>The role of a student taking a test or practicing their material.</td>
</tr>
<tr>
<td>Point Sparring</td>
<td>The role of a contender for the point sparring title.</td>
</tr>
<tr>
<td>Offensive</td>
<td>The role an aggressor.</td>
</tr>
<tr>
<td>Defensive</td>
<td>The role of a defender.</td>
</tr>
</tbody>
</table>

Table 3. Participant Roles

**Staff and Peripheral Roles:**

The virtual nature of the simulation limits the number of staff and peripheral roles. For the instruction portion of the course, the main staff role is that of a black belt karate instructor. During the simulation portion of the course, a simulation operator helps the student put on the simulation gear, calibrates the simulator, and runs the simulation. When the student is using the virtual karate environment simulation, the virtual roles in the simulation change depending on the mode of operation. See Table 4 for peripheral roles.
<table>
<thead>
<tr>
<th>MODE</th>
<th>PERIPHERAL ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>The role of virtual human target.</td>
</tr>
<tr>
<td>Point Sparring</td>
<td>The role of a virtual contender for the point sparring title.</td>
</tr>
<tr>
<td>Offensive</td>
<td>The role a virtual defender.</td>
</tr>
<tr>
<td>Defensive</td>
<td>The role a virtual aggressor.</td>
</tr>
</tbody>
</table>

Table 4. Peripheral Roles

**Events/Projected Sequences:**

The virtual karate environment simulation segment of the course only represents the technology infusion portion of a completely new method of teaching karate. See Charts 3 and 4 for the complete course proposal sequence. The simulator has four major methods of operation: 1) Fighting Routine; 2) Point Sparring; 3) Offensive Posture; and 4) Defensive Posture. The Fighting routine selection can be further refined to either Instructor Assessment or Personal Assessment. The Offensive Posture can be run in Normal Mode or Isolation Drills. Each method of operation is capable of running in any of the four possible modes -- Demo, Guided, Monitored, or Test. When all the various methods and modes are considered, the virtual karate environment simulator can operate in twenty-four different configurations. See Chart 5 for the simulation selection possibilities. This chart represents the event of the student making an initial simulation selection.

Each simulation method can be further refined. For example, the Fighting Routine simulation can request the student to execute the fighting routines using three possible
formats -- individually, sequentially, or randomly, resulting in a single simulation mode having eighteen possible selection possibilities. See Chart 6 for an example of the Demo mode simulation selection possibilities. This chart represents the event of the student further defining the demo mode simulation criteria.
INSERT 3,4,5,6
The permutations of the various simulation selections create both a complexity for the simulation developers and variety for the student. A modular approach to the development of the simulator will aid in managing the complexity. The are several steps required by the student regardless of simulation selection criteria. See Charts 7 and 8 for this basic simulator utilization sequence. This sequence delineates the event of a student using the virtual karate environment. The steps in this sequence are common to modes of simulator operation.

A further decomposition of Chart 7 can result in thousands of different events as a result of the variability made possible by simulation. An example of one of the possible sequences of events would be a student running the fighting routine simulation in test mode. Having completed the basic simulator utilization sequence, the student would be asked, "Is this your first time using the simulator?" First time users would receive a brief by the simulator operator on the simulator basics. This is an attempt to let the student know what to expect. Next, the student must select individual, sequential, or random mode. The simulator prompts the student to begin. The simulator, providing appropriate feedback when necessary evaluates each execution of a fighting routine. For the rest of the sequence of events of a test mode fighting routine simulation selection, see Charts 9 through 12.
INSERT 9-12
The modular approach to the design of the simulator and utilization of object oriented programming will be required to make the simulator effective and efficient. The individual kicks and punches could be programmed as objects. Fighting routines would become various combinations of objects. The eighteen basic techniques and fourteen fighting routines could be developed from roughly a half dozen objects. With the similarities between the multitude of sequences of events available in the simulator, the series of charts included in this proposal will provide the basic framework for the majority of remaining charts. If tasked to create the additional charts in a real proposal, I would employ some of the readily available I-CASE (integrated computer software engineering) tools. Utilizing object oriented programming and I-Case, the complex may not seem so complex.

**Consequences:**

The consequences of the simulation are dependent on the mode of operation. The primary mode of operation is Assessment Mode with selection of the Instructor assessment option. Failure to pass this simulation mode results in the student receiving one-on-one instruction prior to re-testing. Inability to pass this assessment phase equates to not being able to test for their belt-- a karate career-ending situation. Operation of the simulation in the Assessment Mode with selection of the Student assessment option may result in the consequence of the student improving their technical performance and enhancing their self-defense abilities. On the remaining three modes of simulation, the consequences of poor performance may be indicative of possible injury if ever in a real life crisis situation.
Resource Requirements:

The resources required for the virtual karate environment simulation are as follows:

- A 16’ x 16’ room for the virtual reality simulation.
- Several rolls of blue and red 2” wide duct tape. Used for marking the sparring ring.
- A specially designed gee with wireless transmitters.
- A set of sparring kicks and punches rigged with sensors and wireless transmitters.
- A sparring headgear rigged with virtual reality display system.
- A Sun workstation for running the simulation.
- A printer for generating reports.
- A video tape recorder and monitor.