HumMod User's Manual
Version 1.2
http://www.hummod.org

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(page numbers to follow upon completion of manual – table of contents items and order subject to change on the slightest whim)

Installation

HumMod is available for download from our website, which can be found at http://www.hummod.org. The modeler and related files are available as a zip folder. To install HumMod, simply download the folder and unzip it to the directory of your choice. HumMod can then be opened by running the executable file HumMod.exe.

Introduction

HumMod is an integrated computer model of human physiology which allows the accurate simulation of the effects a person's changing environment can have on their physiology. It is developed and maintained by the University of Mississippi Medical Center, and is the successor to the QCP (Quantitative Circulatory Physiology) program.

HumMod allows you to create disturbances in the environment and physiology of a virtual person and to track the effects these changes have over time, and then, if desired, to attempt to use simulations of clinical methods. Disturbances can be environmental (i.e. the atmospheric pressure surrounding them), related to normal physiology (i.e. the amount and intensity of physical exercise the patient is undergoing), or related to pathophysiology (i.e. the patient has diabetes mellitus).

HumMod also allows you to control the person's daily schedule, such as when they eat, when they exercise, when they work, and when they sleep.

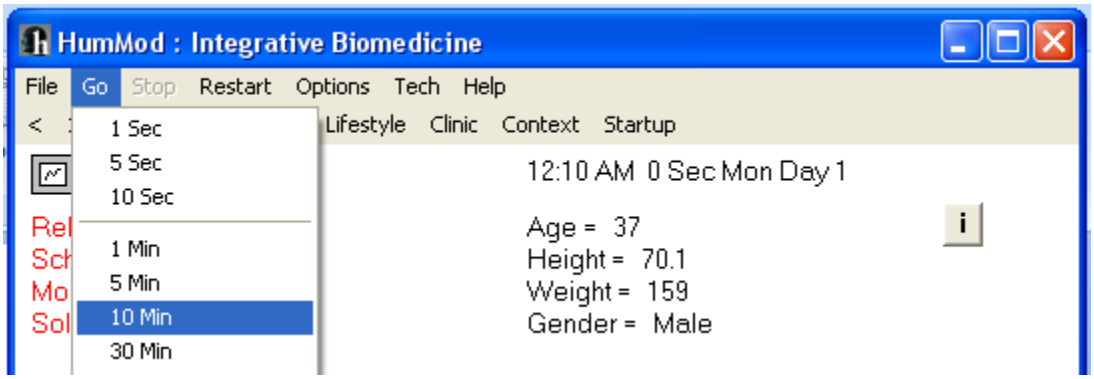
The first portion of this manual will address the basic premise of the program, describe the various commands the program has available, and contains several sample executions. This section of the guide is most useful to users that are unfamiliar with concepts of computer simulation or have not operated HumMod or its predecessor, QCP, before (though QCP users may benefit from reading the information regarding the user interface, as it has changed significantly).

The second portion of the manual is an in-depth index of all displays that can be accessed and all parameters that can be changed in a simulation. Hence, the second portion is much longer than the first. Use of a find function to pinpoint the section you are looking for is recommended rather than trying to search manually.

Commands

When HumMod is first open, it will be set to display the "Chart" results under the "Clinic" dropdown menu by default. The patient will also have the default characteristics of a 5'10", 170 lb, 37-year-old man, existing in an uninteresting room temperature environment and following a fairly normal daily schedule.

The most basic command in HumMod is the "Go" dropdown menu. Since solutions in HumMod are calculated as a function of time, time must be advanced in order to achieve results.



Advancing a patient under the default conditions for any period of time will yield predictable benchmark results.

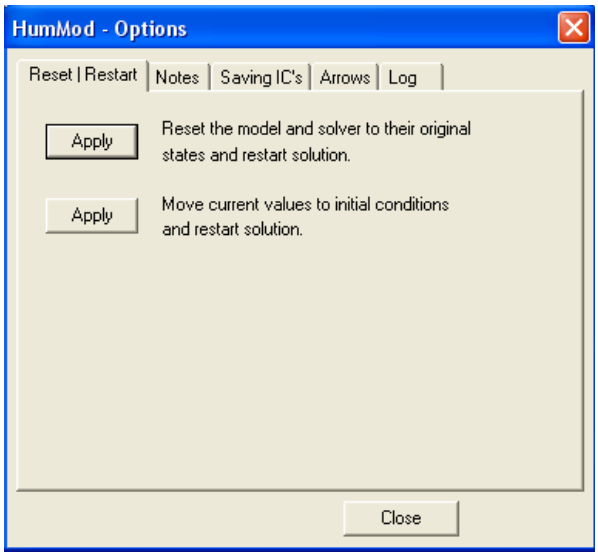
The "Stop" command can be used to pause the advancement of the simulation at any time if the user desires to examine a specific point or to change something before the simulation reaches its originally scheduled duration.

The third command is "Restart"—this command immediately erases all data and sends the program back to its default parameters. The Restart command should be viewed with absolutely no less awe and respect than the act of physically shaking an Etch-a-Sketch. If you hit it, and you did not mean to, tough cookies, your work is gone. So be careful.

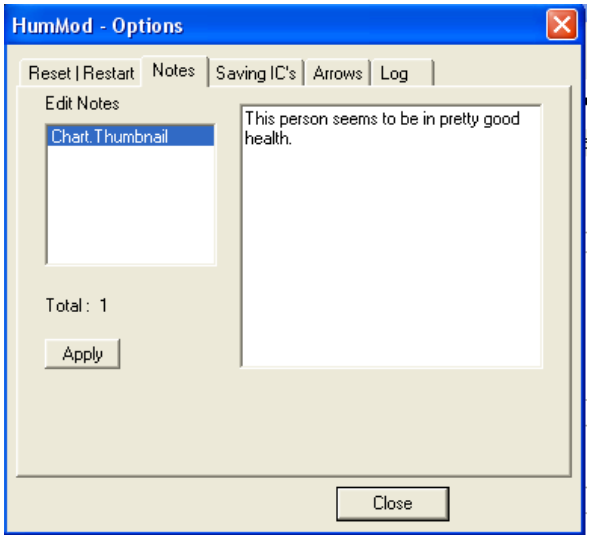
Saving and Loading

There are two types of files that can be saved and loaded. The first is initial conditions, and the second is results. The initial condition refers to the physiological and environmental constraints that have been placed on a person before any time is actually advanced. Initial conditions files can be loaded or saved using the .ics file extension. Likewise, you can save the data that contains the solutions to the situations you create, as a .sol file. **Windows XP users take note:** The program is having difficulty communicating with the XP operating system with regard to file extensions when saving or loading. It is still possible to manually save solutions as a .sol file, but even manually adding the .ics extension does not currently work, meaning only solutions can be saved in XP (However, you can still load .ics files saved on another computer and transferred).

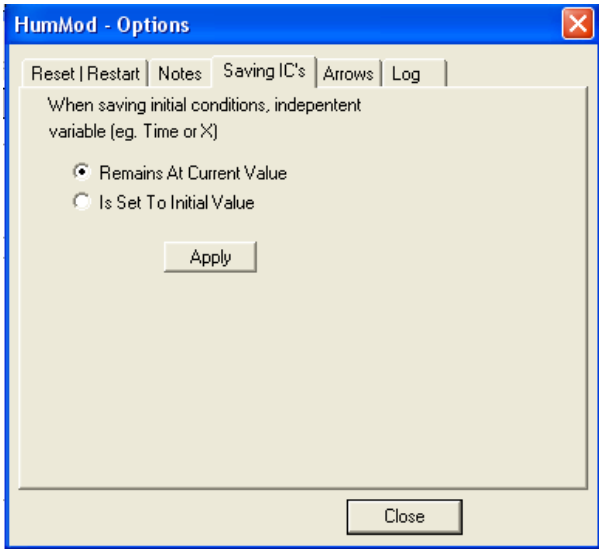
Options Window



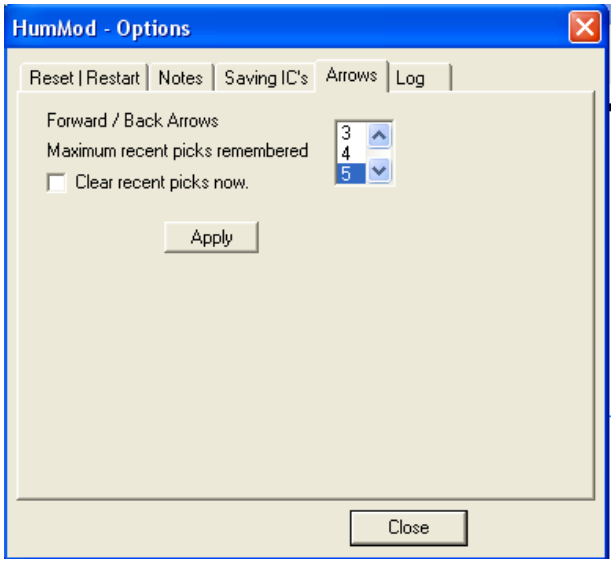
The options window contains a couple of different subsets. The first tab is "Reset/Restart." There are two buttons under this category. Picking the first option will duplicate the action of the "Restart" button and clear all data while returning values to their default settings. Clicking the second button will reset the solution to time zero and initial conditions but keep environmental and physiological factors at the values they have been changed to.



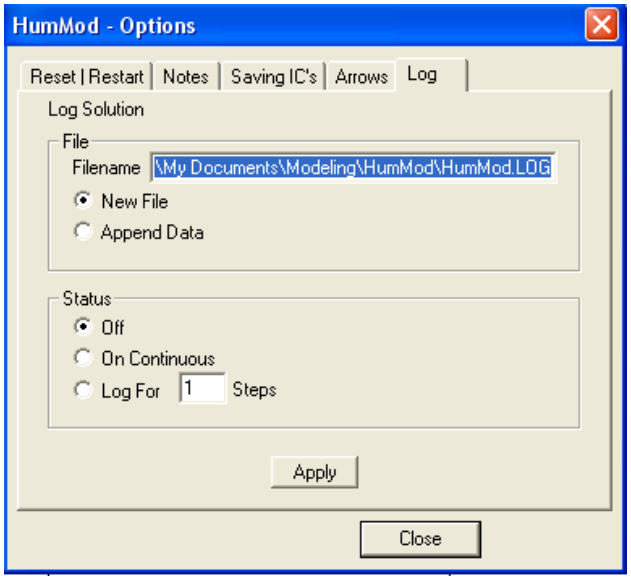
The second tab under options allows for the notes section that occupies part of the "Chart" display (the default display) to be edited. Additional notes can be added or erased as desired.



The third set of options allows you to decide whether saving initial conditions will record the current time as the current time or set it to the initial value.



The fourth set of options allows you to set how many operations the forward and back arrows will remember, up to a possible maximum of 10 choices.



The final operation in the options window allows you to create a real-time log of the information recorded by the program. You can either append an old log file or make a new one at the destination which you specify. The bottom box allows you to toggle the log on or off, and also allows you to set the log to end after a certain number of steps.

Help

The help tab is used to access the program's version information and developer contact information, just in case HumMod's operation fills you with an unquenchable rage and you feel the righteous need to viciously harangue and malign those responsible for its existence.

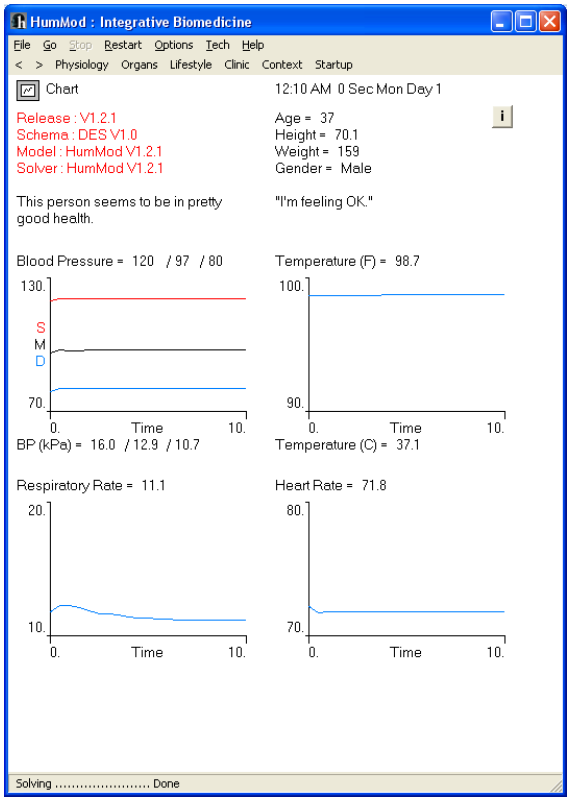
Forward/Back Arrows

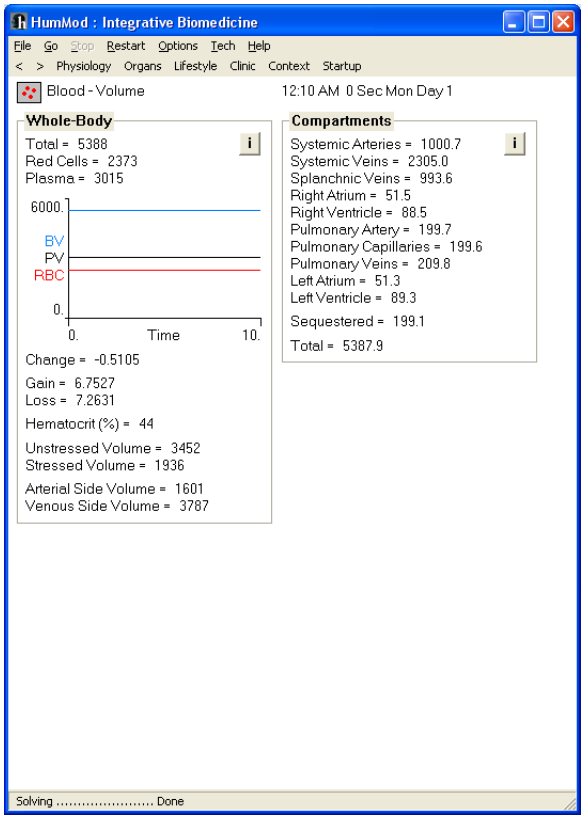
The back arrow acts as an "undo" operation, immediately rescinding the last change you have made in the simulation—if you just changed to a different display, say from "Chart" to "Daily Planner," it will return you to the previous page that you were on, and if you change a condition, such as increasing or decreasing the person's caloric intake, it will return the value changed to its previous setting. However, it does not wind back time if you make an advancement that you did not mean to, so be careful when advancing time in sensitive simulations.

The forward arrow undoes the undoing, and returns the last change that was wiped away by the back arrow, whether it be conditional or navigational.

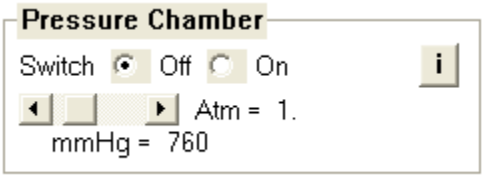
The forward and back arrows will still maintain a navigational history and allow you to switch display pages even after the Restart command has been used to reset the simulation.

Basic Operation



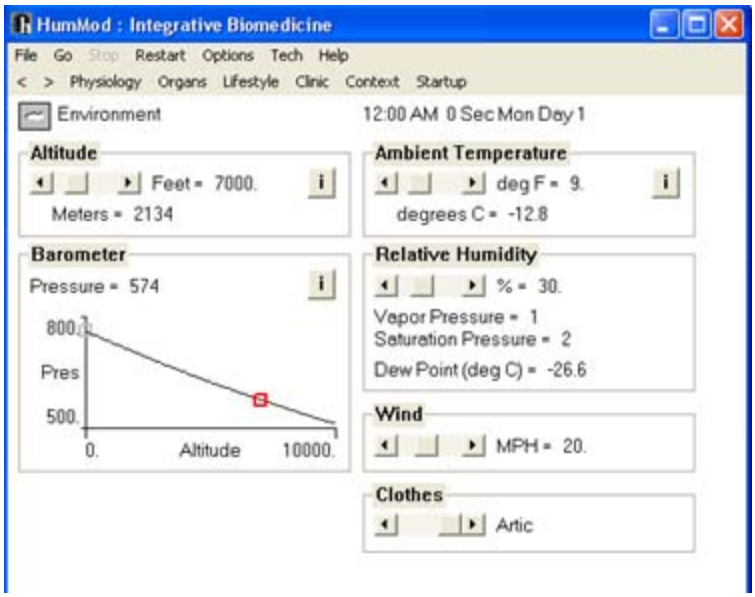


Creating a basic solution in HumMod is quite simple. Any advancement of time will yield results in five-thousand-odd variables that run the program. For example, just opening the program and immediately advancing it some period of time will give you basic results: A blood pressure of about 120/80, an internal temperature of around 98.6˚F, a respiratory rate of roughly 11.3, and a heart rate of approximately71 BPM. This is the default Chart display which is opened up every time HumMod launches (Figure A). However, using the dropdown menu, you can navigate to any number of displays, such as our ersatz human's blood volume statistics (Figure B). Any number of conditions or parameters can also be changed in order to create certain scenarios and results in the simulation. Conditions are changed either through the use of radiobuttons (used for options that are toggled on/off) or sliders (used to set variables which have many possible quantitative settings). Another important feature of HumMod's user interface are the information boxes contained in many of the displays. Clicking on these boxes will yield a dialog box holding information about the box, usually being either the normal values in a human being for the variables in the box, the units they are measured in, conversion factors for several units, or combinations of these three.



Sample Execution

The following is a walkthrough of a demonstration in which several of the virtual person's environmental variables are changed and the effects of these changes are modified over time. First, open HumMod. It should be set, as always to the "Chart" of a patient with default statistics. Use "Go" to advance the patient 10 minutes. His uninteresting vitals should be just as uninteresting as they were when you started. Now we're going to invoke a severe environmental change on our poor guinea pig. Out of nothing other than caprice, he is now a mountain climber that has become stranded, so we'll need to change his environmental factors to match the circumstances that his mid-life crisis has forced him into. The bottom row of dropdown menus controls the navigation to all of the variables that the program can monitor and all of the factors that can be changed. The "Environment" options and display can be found under the "Lifestyle" dropdown menu. Select this "Environment" option so that it can be changed in order to simulate our marooned mountaineer. The Environment page allows you to control temperature, altitude (which changes atmospheric pressure), wind speed, relative humidity, and the level of clothing worn by the patient (a choice between "no clothing", "summer", "normal", "winter" and "arctic"). Let's have our subject stranded at 7000 feet (2134 meters for the metrically inclined), suffering through 20 mph winds at 9˚F. Thankfully, he has managed to wrap himself in very warm clothing in an attempt to hold out for rescue, which is arbitrarily 30 minutes away. Mystically, he has also apparently not been experiencing these conditions until this moment. Now we can advance time and monitor his progress. Use Go to advance 30 minutes. If you check "Chart" under "Clinic," a readout will tell you that the patients vitals are fairly close to normal, he is experiencing no symptoms of either exposure or oxygen deprivation, and he will quite easily make rescue. However, if you make the temperature, wind, and altitude conditions more severe, you can easily send the patient into hypothermia and a host of other nasty conditions. Were you to do this, the patient would develop conditions and symptoms as time advanced. Every time the model



calculates that the patient is experiencing a physiological aberration, such as their body temperature dropping to 80˚F or something minor like that, a dialog box will interrupt the operation of the program with the patient's "description" of their symptom, such as "I'm like….confused." At this point, you are given the option to halt the simulation rather than continuing it for the time you originally requested so that you can examine the detailed statistics of the patient's current existence, and, if desired, to initiate treatment or adjustment to their surroundings in order to try and rescue them.

Quick Command List Overview

The dropdown lists on the second row control what screen is currently being displayed by HumMod. As stated earlier, the default is "Chart," a basic physiological overlay accessed through the "Clinic" menu.

The first tab is "Physiology." Physiology focuses on things like the concentration of electrolytes in the body, and the overall activity level of several organ systems such as the circulatory system.

The second tab is "Organs." Organs contains in-depth information regarding the function and level of health of specific organs, including size, tissue damage, and fuel consumption, among other things.

The third tab is "Lifestyle." Lifestyle controls the environment of the model, from clothing to exercise to the actual environment that the person can be found in.

The fourth tab is "Clinic." Clinic contains displays that are medical in nature, allowing for the patient to be treated with different drugs and anesthesia, as well as allowing for the activation of afflictions such as hemorrhage.

The fifth tab is "Context." Context shows basic information about the patient such as their gender, body size, and age.

The sixth tab is "Startup." Startup displays the original values of physiological variables used by HumMod, and also displays the current values held by those variables.