مدل شبیه‌سازی JACK و کار با نرم‌افزار آن با رویکرد ارگونومی

مدرس: پیام حیدری

Inventory of Tools for Ergonomic Evaluation

1. Tools for Strategic Decision making

2. Tools for Work System & Product Design

A. Complex Human Simulation Models

B. Simpler Computerized Human Biomechanical Models

C. Design Checklists and Other Design tools

D. Flow Simulation Tools

E. Tools for Product Design

A. Complex Human Simulation Models

- Jack
- Ramsis
- SAFEWORK
- ENVISION/ERGO
- eMHuman
- ERGOMan
- ManneQuinPRO
- IPME

B. Simpler Computerized Human Biomechanical Models

- 4D WATBAK
- 3D SSPP
- BakPak

C. Design Checklists and other Design Tools

- Design for Assembly (DfA)
- ErgoSAM
- ERGONOVA
- FMEA tools

D. Flow Simulation Tools

- Simul8
- Delmia
- Technomatix
- microSAINT

E. Tools for Product Design

- Quality Function Deployment
- Kansei Engineering

3. Instruments for Evaluating Work Environment

- Tape measure
- Stopwatch
- Counter
- Data Loggers
- MEGA Electronics
- Lumbar Motion Monitor
- SEIP
- Vibration & Sound meters

4. Computer Based Evaluation Tools

- ALBA
- BUMS
- ErgoIntelligence & Ergomaster
- ERGOMIX
- ERGOWATCH
- FIT – Flexible Interface Technology
- HARBO
- Job Evaluator Toolbox (JET)
- NIOSH lifting equation
- The Observer XT
- PEO – Portable Ergonomics Observation
- PostureProgram
- VIDAR/PSIDAR

5. Checklists for Workplace Evaluation

- ’Arbetplatsprovaren’
- ‘Arbetsmiljön i skolan’
- Ergonomitermometer
- Ergonomiska Checklista Datorarbete
- Keyserling checklist
- MAC – The Manual Handling assessment Chart
- ManTRA
- NIOSH equation

- Psychophysical ratings
- Psychophysical tables
- PLIBEL
- REBA
- Risk Filter
- RULA
- The Strain Index
- QEC
- OCRA
- OWAS
- WEST – Work Environment Survey Tool

6. Questionnaires on Risk Factor Perceptions

A. Physical Risk Factors

- DMQ
- Nordic Safety Questionnaire
- RFQ - Risk Factor Questionnaire

B. Psychosocial & Psychophysical

- CopSoq
- Job Content Instrument
- PAK
- Psykisk Arbejdsmiljø
- QPS Nordic & QPS34+

7. Questionnaires on Health & Wellbeing

A. Fatigue, Motivation, Satisfaction etc

- SOFI
- Stress-Energi
- Job Satisfaction
- NASA-TLX

B. Pain, Disability & Symptom syrveys

- DASH
- NIOSH survey
- Nordic
- SF-36, SF-12
- Tools for Modified Work

8. Economic Models

- Work Ability Model
- PREVIA model

Jack

- Tecnomatix Jack its a human simulation tool that is used to populate designs with virtual people and perform human factors and ergonomic analysis. You can use Jack to simulate, test, improve and refine product designs and industrial tasks using the most comprehensive set of human performance tools available on the today.

- Jack helps you seamlessly integrate human factors and ergonomics into the planning, design and validation stages of your product lifecycle. Jack enables you to size your human models to match worker populations, as well as test your designs for multiple factors, including injury risk, user comfort, reachability, energy expenditure, fatigue limits and other important human parameters.

- Manufacturing companies in a variety of industries are addressing the ergonomic aspects of manual operations during the early stages of product design and manufacturing planning. Jack and Process Simulate Human enable you to improve the safety, efficiency and comfort of your workplace environment using digital human models. You can analyze your workplace environments with virtual people that can scale to match different population characteristics. You can test your designs and operations for a wide variety of human factors, including injury risk, timing, user comfort, reachability, lines-of-sight, energy expenditure, fatigue limits and other important parameters.

Here are some Features of "Tecnomatix Jack":

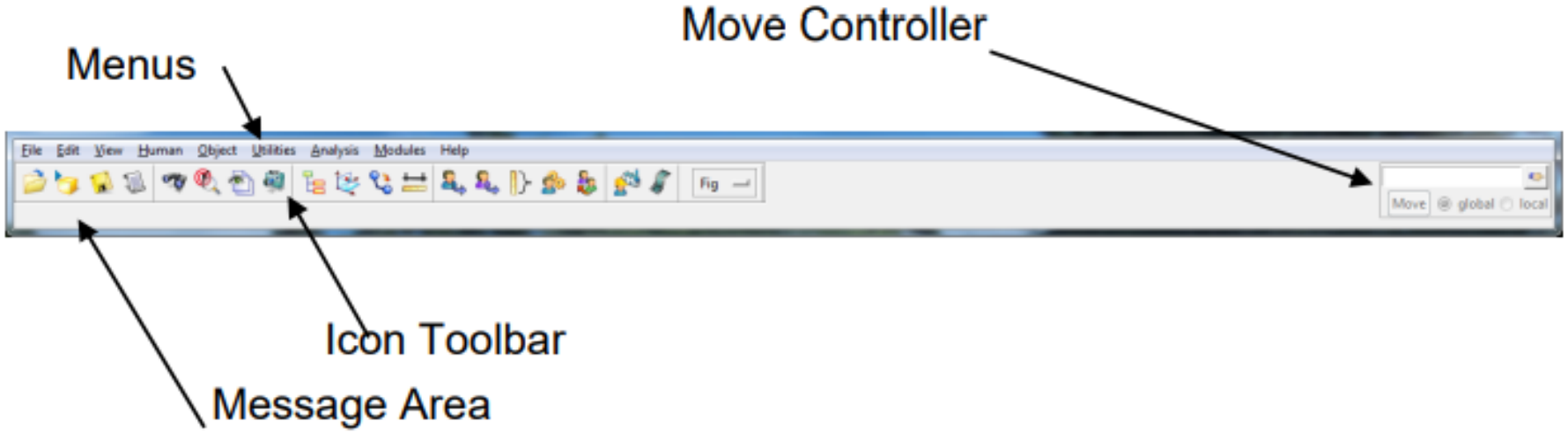
- Scalable human figures that are anthropometrically and biomechanically accurate
- Support ergonomic analysis of your global workforce using country-specific population databases and advanced anthropometric scaling
- Comprehensive suite of ergonomic analysis tools
- Advanced posture algorithm that can also analyze how a body reacts to exerted force in a specific direction
- Manage a wide range of workplace scenarios that include working at different levels of elevation, stairs and ramps
- Eye-view windows and field-of-vision analysis
- Reach envelopes for fast workplace configuration
- Broad virtual reality motion capture hardware support, including Microsoft Kinect® for Windows

Some of the areas where Jack excels are:

- Creating and visualizing ―digital mock-ups‖ of designs
- Analyzing human factors in designs
- Studying humans in the ―simulated workplace‖
- Evaluating maintenance operations
- Training
- Research

Jack gives you:

- A System for modeling ANY articulated figure
- Human Bodies
- Real-time viewing environment
- Complete animation and task simulation systems
- Powerful extensions


Move Controller
Menus
File Edit View Human Object Utilities Analysis Modules Help
Fig
Move global local
Icon Toolbar
Message Area

Control Bar

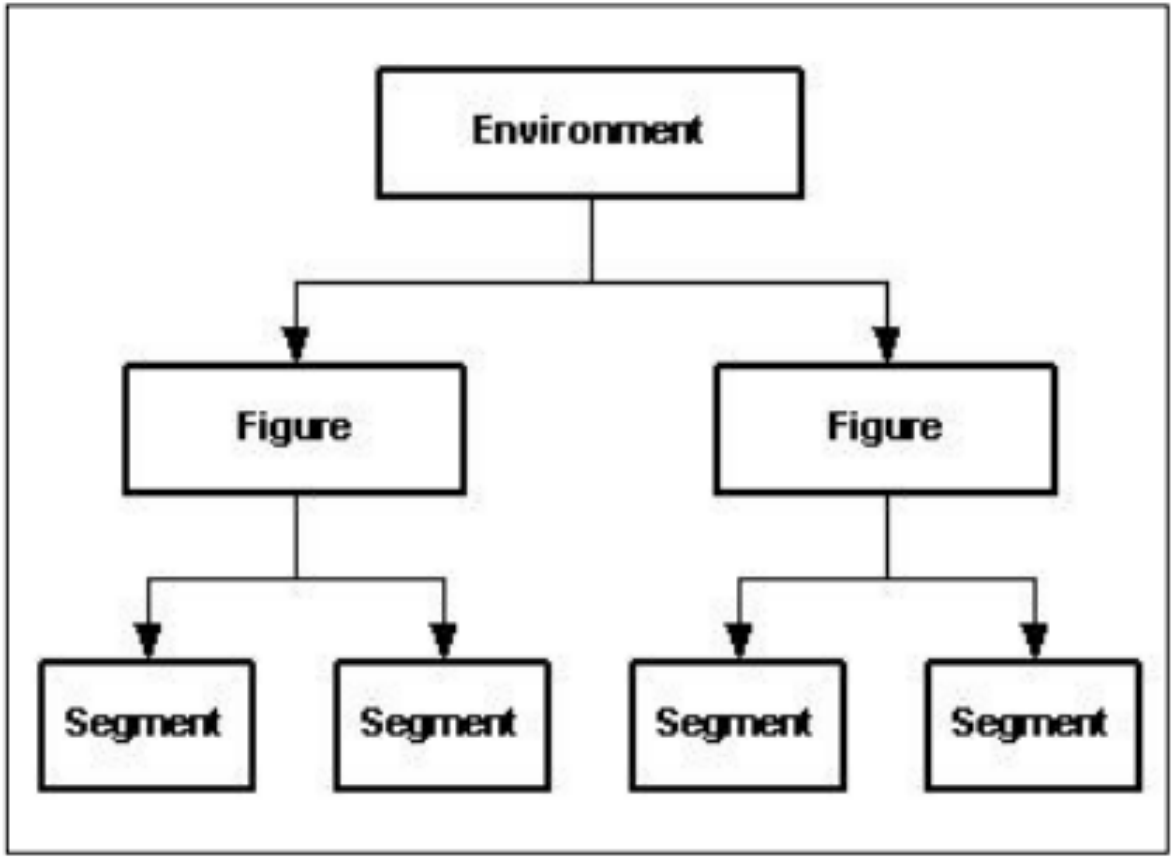
Icon Toolbar

The TOOL BAR icons give you quick access to commonly used functions.

	Open File		Import File
	Save Current Scene		Toggle Log Window
	View and Center Objects		Zoom To
	Manage Named Views		Toggle Object Hierarchy
	Move Figure		Adjust Joint
	Open Advanced Rulers		Create Male Manikin
	Create Female Manikin		Scale Human
	Open Human Control Panel		Copy Human Attributes
	Task Simulation Builder		Task Animation Window
	Object Level Selector		

	LMB	Translate along the x-axis
	MMB	Translate along the y-axis
	RMB	Translate along the z-axis
SHIFT	LMB	Rotate about the x-axis
SHIFT	MMB	Rotate about the y-axis
SHIFT	RMB	Rotate about the z-axis

Command		**Result**
CTRL	LMB	Rotate the camera
CTRL	MMB	Pan
CTRL	RMB	Zoom
CTRL + SHIFT	LMB	Rotate the View Reference
CTRL + SHIFT	MMB	Pan
CTRL + SHIFT	RMB	Push/Pull the View Reference



Jack Modeling Hierarchy

Environment

(Command: File➔Save➔Scene)

At the highest level, systems are defined as scenes or environment structures. The environment is a collection of “figures.” Each figure consists of one or more “segments.” Segments in a figure are connected to each other by joints. In other words, a figure is an assembly of segments.

More importantly, the environment contains information required to regenerate a particular scene (for example: relative locations between figures, joint positions, size, and other constraints). These files have the extension .env.

.env files contain:

- References to Figure Files (.fig) and Segment Files (.pss)
  - Figure and Segment Files can also be embedded in the .env file
- Relative Locations of the Figures
- Joint Angles/Positions
- Geometry Scaling

Note: A Figure File (.fig) includes information about which segments make up the figure, sites, colors, and joints connections. (Joint connections and limits are retained when a figure file is saved. Joint angles information is not contained in a figure file.) Select the Include attributes check box to save attribute information (for example, color selections)

Segments

(Command: File➔Save➔Psurf)

Segments make up the lowest level of the hierarchy. They consist of tessellated geometry data that makes up an object. This data is stored as ASCII text in a Psurf (polygon surface) file that can be opened with any text editor. This format is consequently easy to view and edit. These files have the extension .pss. Two sample

Psurf files are shown below in order to illustrate how segments are constructed.

Note: Remember the properties of the different file types.

A Psurf (.pss) file, also referred to as a segment file, only contains information defining a segment's geometry.

A Figure File (.fig) includes information about which segments make up the figure, sites, colors, and joints connections. (Joint connections and limits are retained when a figure file is saved. Joint angles information is not contained in a figure file)

An Environment File (.env) includes all the information required to recreate a scene. It contains information defining relative locations between figures, joint positions, size, and other constraints.

Manipulations

(Command: File➔Save➔Manipulations)

A scene or figure whose positions you want to use again later may be saved as an .env file. Select the Include Camera check box to save the coordinates of the current camera viewpoint coordinates.

Manipulations save the figure positions and joint angles. When loaded they allow you to reposition your loaded figures.

File Archiving

(Command: File➔Archive➔Save File to Archive)

The save file to archive feature allows users to a) save a file to a specified directory, b) save as one zip file, or c) both. Archive files are written out compressed, generally resulting in much smaller file sizes, especially when using psurf-only geometry.

Note: When saving your data to a directory, it is recommended that a new folder is created, to avoid overwriting data in a previously existing folder.

Import

(Command: File➔Import)

Jack is intended to be used with other design and analysis software packages. Thus, geometry import and export capabilities are necessary to allow the transfer of data to and from Jack. Typically, you will bring geometry data for the scene to Jack from external sources, perform your analysis, then export geometry to downstream processes for further use.

Objects can be imported from CAD programs, opened from object libraries, or even created from basic CAD figures from within Jack.

Import Formats

Jack can directly open Vis (.jt) files and can import Vis (.jt), VRML 2.0 (.wrl), IGES(.igs, .iges), stereolithography (.stl), inventor (.iv), and optimizer (.csb) files directly. Command line translators are also available for these formats. In this chapter we will translate files from several of these formats. Translation can be accomplished from both the command line and directly from within the program.

Format	**File Extension**
Vis / DirectModel	(.jt)
VRML 1.0 / 2.0	(.wrl)
IGES 5.3	(.igs)
Stereolithography	(.stl)
Optimizer 1.1	(.csb)
Deneb IGRIP 1.2 parts	(.igp, *)

THANKS

Any questions?

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