



A Mobile Design Application for Energy Efficient Buildings

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Overview of presentation

- Background and motivation
- Development
- Testing and evaluation
- Application interface
- State of development
- Conclusion



Background and motivation

Background

- Poorly designed buildings use large amounts of energy
- Majority of this usage from HVAC systems



Background

- Building design affects energy usage
- Thermal analysis important for initial design phase
- Manage demand-side before construction starts

Motivation

- Modern thermal analysis requires:
 - Requires dedicated computer
 - Detailed information
- Analysis becomes:
 - Complicated
 - Time consuming

Motivation

- Thermal analysis rarely incorporated into preliminary design practice:
 - Preliminary design
 - Consultation with clients
- Current methods:
 - Experience
 - Expert rules



Development

Development

- Design tool needs:
 - User-friendly interface
 - Easily interpreted results
 - Low cost
 - Simulation speed
 - Design comparisons
 - Default values and templates
 - Inclusion of building codes/energy ratings

Development

- Software already exists
- NewQuick
 - Developed and tested in late 1990's early 2000's
 - Viewed as quintessential example of simplified design tool by many
 - Development abandoned in mid 2000's

Development

- NewQuick designed to run on old hardware
- Modern smartphones easily meet resource requirements
- Possibilities as a mobile application
- QUICK Mobile

Development

- QUICK Mobile features:
 - Accurate simulation
 - Fast simulation time (runs in ms)
 - Easy to use
- QUICK Mobile ideal for:
 - Preliminary design
 - Consultation with clients



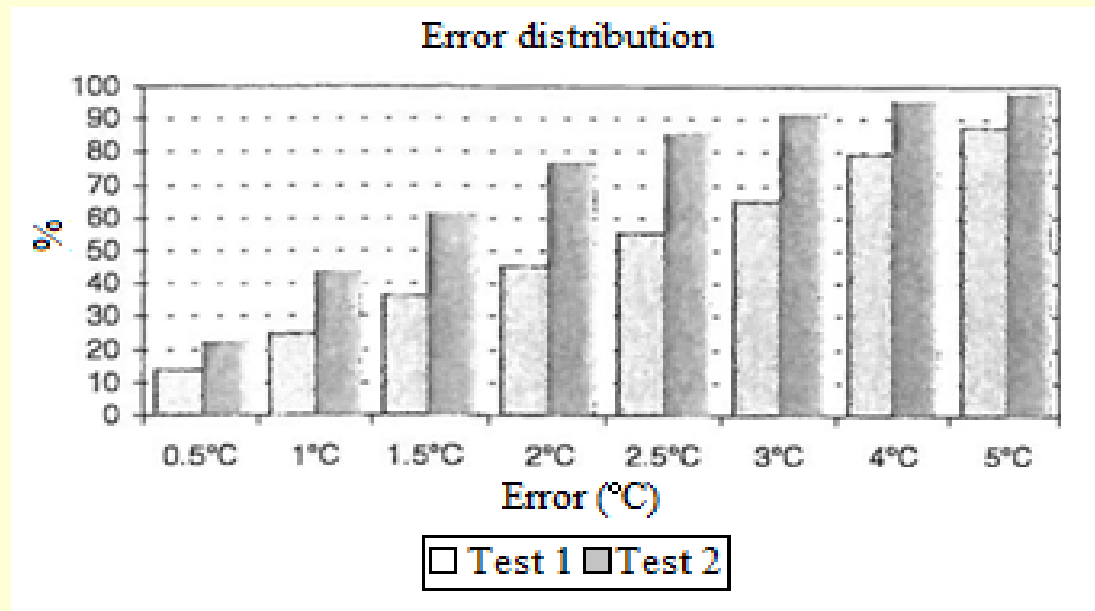
Testing and evaluation of simulation model


Testing

- NewQuick tested in two tests in 2001
- 89 verification studies/56 building zones
- Two sets of tests:
 - 1) Using default figures
 - 2) Using detailed figures

Evaluation

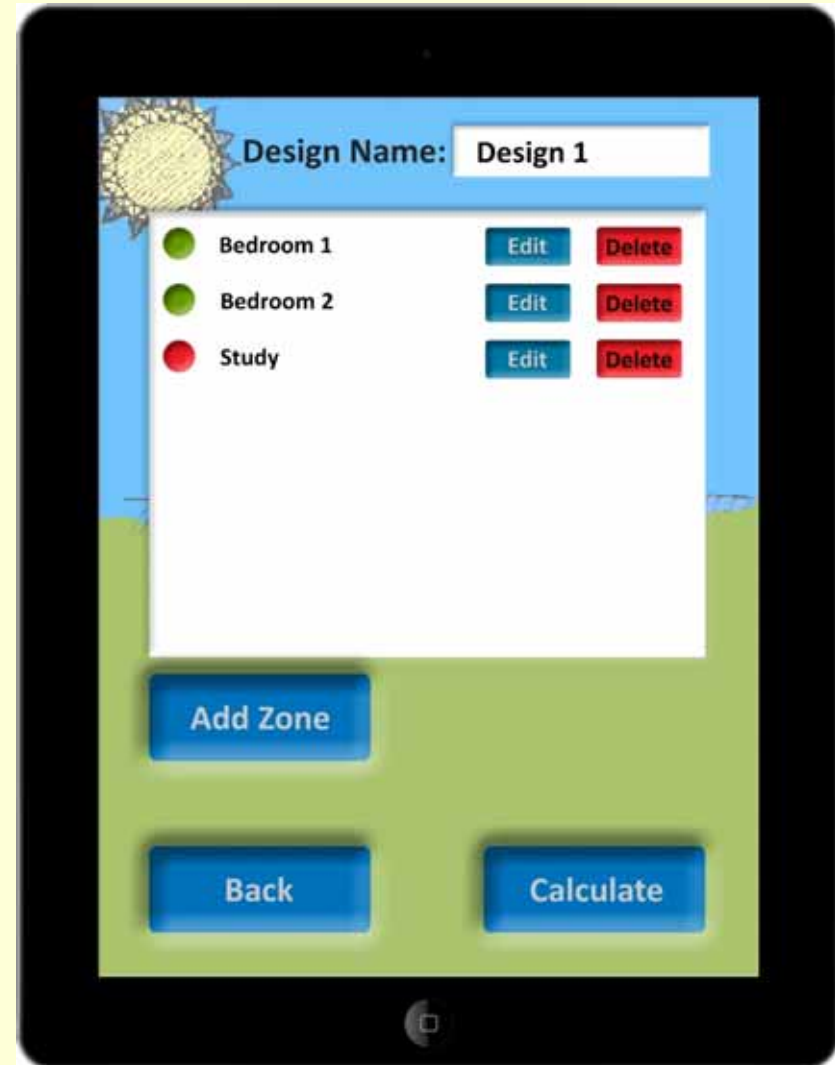
- Test 1 accurate to 3°C - 65% of time
- Test 2 accurate to 3°C - 90% of time





Application Interface

Application Interface



Application Interface

Zone Details:

Zone Name: Study

Zone Description: The study adjoining the main bedroom.

Zone Type: Residential

Zone Location: Pretoria, Gauteng

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Building Geometry:

North Wall Length: 15.5 m

Internal Floor Area: 162.0 m²

Number of Storeys: 1

Height per Storey: 2.75 m

Wall Specifications:

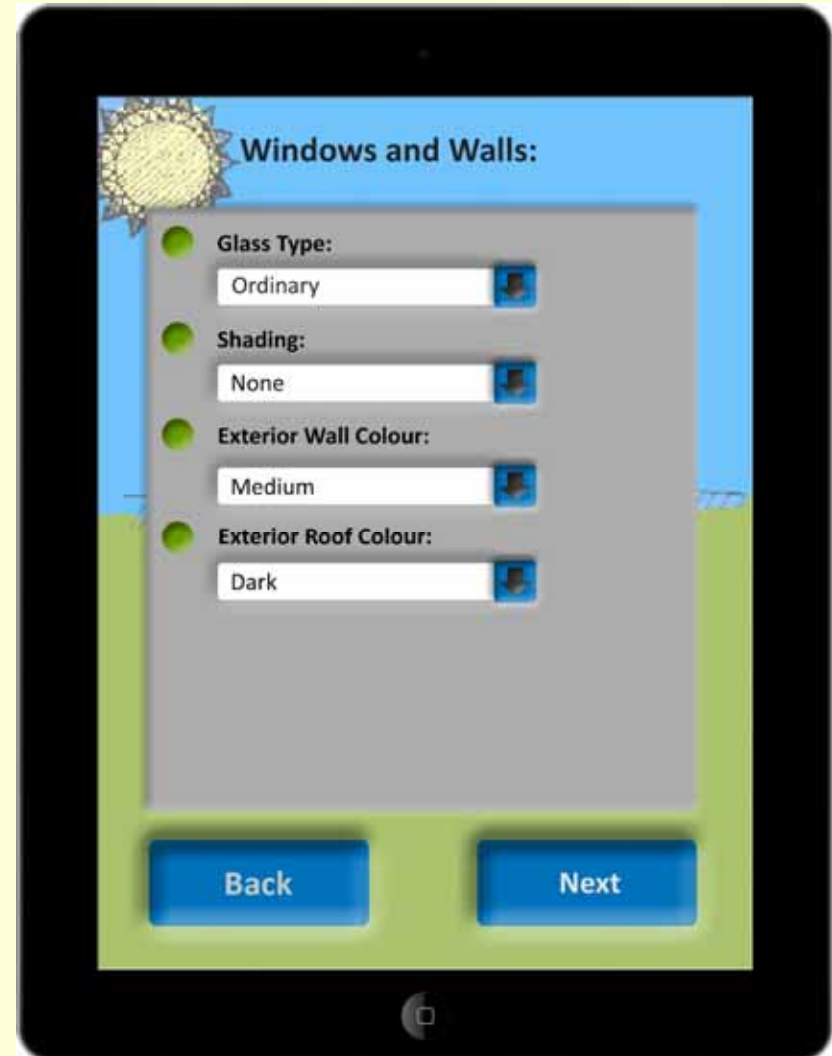
| | Exposed to Outdoors? | Percentage Window? |
|---|-------------------------------------|--------------------|
| N | <input checked="" type="checkbox"/> | 20.0 % |
| E | <input type="checkbox"/> | 0.0 % |
| S | <input checked="" type="checkbox"/> | 10.0 % |
| W | <input checked="" type="checkbox"/> | 20.0 % |

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Application Interface



Application Interface



Application Interface

Heat and Orientation:

Internal Heat Generation:

How much heat is generated indoors?

None

Default

Calculate: W/m²

Specify: W/m²

Building Orientation:

What is the orientation of the North wall?

Specify:

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Other Specifications:

Roof Type:

Wood / Airspace / Ceiling

Ground Floor Type:

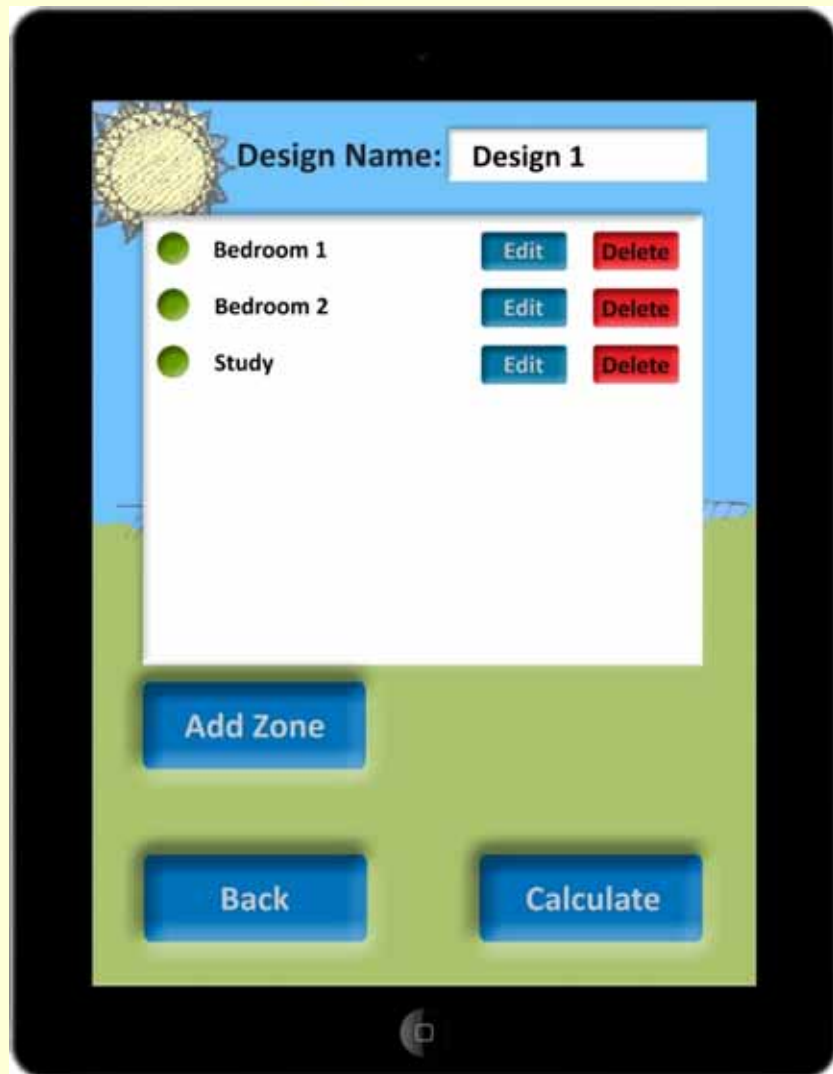
Wood / Concrete / Ground

Intermediate Floor Type:

Wood / Airspace / Ceiling

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Application Interface




State of development

- Application currently in early design phase
- Simulation model already proven
- Currently gauging interest in application

Conclusion

- Need for simplified design tool exists
- Tool should be:
 - Accurate
 - Fast
 - Easy to use
- QUICK Mobile application satisfies these requirements



Questions?