UNITS
User's Guide

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UNITS is a software package for easy unit handling in TCL. In any physical system, units play a critical role when specifying parameters and initial conditions. No physical quantity is meaningful unless it is specified with its unit.

However, there can be many different units even for the same quantity. For example, lenghts may be given in cm and m, or inches and feet. Usually a single person will adopt a *unit system*, by saying "I'll use cm for length units.". But not all users will be consistent with each other. Thus a need arises where the user can specify the unit together with the quantity.

This need is the underlying philosophy beyond UNITS. By using UNITS, the user is able to attach units to physical quantities in the system, which will eliminate confusion when talking to other people. A consistent unit system is used, and can be changed with a single command if desired.

1 Installing UNITS

If you have received UNITS together with another package, there is no need for installation, it will be called automatically. If you have received UNITS as a seperate package, you may install it simply by unpacking the compressed archive file, and adding a line like the following to your initialization file:

```
source /home/user/UNITS/scripts/init.tcl
```

2 Specifiying quantities with UNITS

UNITS defines a command called `unit` for specifying units. The syntax is:

```
unit NUMBER UNIT
```

The `unit` command will convert the quantity you have specified into consistent units in the unit system you are using. The list of allowed units can be found in the `script/units.tcl` file. Examples:

```
set length [unit 5 um]
set time   [unit 10 h]
```

New units can be defined (either in the `script/units.tcl` file or in your Tcl script) using the `newunit` command. The syntax is:

```
newunit NAME VALUE OFFSET
```

Here, `NAME` is the name of the new unit, `VALUE` is the multiplier with respect to the base unit, and `OFFSET` is the offset with respect to the base unit. `OFFSET` is optional and is only necessary when the zeroes of the new unit and the base unit don't match (e.g. temperature in °C and K). Look into file `scripts/units.tcl` for use of the `newunit` command.

3 Changing unit systems

If the user wants to change the default unit system (the MKS system), the `base-unit` command may be used:

```
base-unit UNIT=VALUE
```

Here, `UNIT` is a fundamental unit and can be one of the following: `m` (meters), `s` (seconds), `kg` (kilograms), `A` (Amperes) and `K` (Kelvins). `VALUE` is the multiplier of the fundamental unit in the new unit system. In the MKS system, all base units have a multiplier of 1. If the length unit is to be changed to, say centimeters, the multipiler for meters becomes 100: `base-unit m=100`.