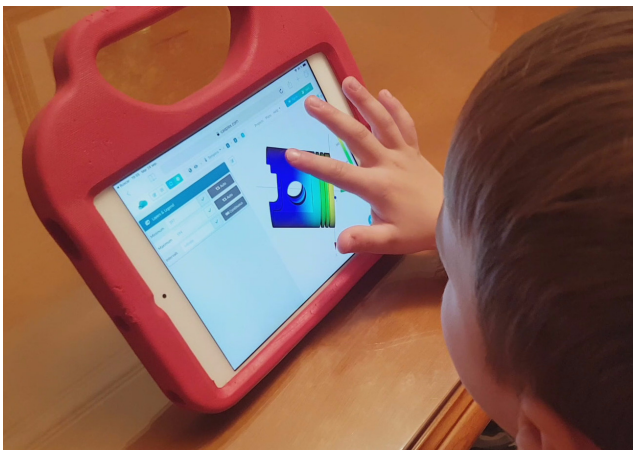

Figure 2: CAEplex is a web-based interface to solve thermo-mechanical problems in the cloud that uses FeenoX as the back end.

FeenoX tries to achieve its goals by…

- standing on both ethical (since it is free) and technical (since it is open source) grounds while interacting with other free and open operating systems, libraries, compilers and pre and post-processing tools, thus encouraging science and engineering to shift from privative environments into the free world.
- leveraging the Unix programming philosophy to come up with a cloud-first tool suitable to be automatically deployed and serve as the back end of web-based interfaces such as CAEplex.
- providing a ready-to-run program that reads an input file at run time (and not a library that has to be linked for each particular problem to be solved) as a deliberate design decision discussed in the Software Design Specifications.
- designing and implementing an extensibility mechanism to allow hackers and/or academics to add new PDE formulations by adding a new subdirectory to `src/pdes` in the repository and then
  a. re-bootstrapping with `autogen.sh`,
  b. re-configuring with `configure`, and
  c. re-compiling with `make`

In effect, FeenoX provides a general mathematical framework to solve PDEs with a bunch of entry points (as C functions) where new types of PDEs (e.g. electromagnetism, fluid mechanics, etc.) can be added to the set of what FeenoX can solve. This general framework provides means to

- parse the input file, handle command-line arguments, read mesh files, assign variables, evaluate conditionals, write results, etc.

```
PROBLEM laplace 2D
READ_MESH square-$1.msh
[...]
WRITE_RESULTS FORMAT vtk
```

- handle material properties given as algebraic expressions involving pointwise-defined functions of space, temperature, time, etc.

```
MATERIAL steel     E=210e3*(1-1e-3*(T(x,y,z)-20))   nu=0.3
MATERIAL aluminum  E=69e3                           nu=7/25
```