

Debugging Hessians

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One way to verify if the Hessian is correct is to use the fact that the Hessian gives you the change in forces when you "hit it" with a change in positions. If dx is some small amount, compute $H * dx = df$. Then compare against $f'(x) = f(x + dx) - df$. $r = f(x) - f'(x)$ should be close to zero if H is correct.

One can create a random perturbation vector doing something like:

```
const double eps = 1.e-6;
// make dx some random small perturbation
std::random_device rd;
std::mt19937 mt(rd());
std::uniform_real_distribution<double> dist(-1.0, 1.0);
MatrixXd dx(9, 1);
for (int i = 0; i < 9; ++i) {
    dx(i, 0) = eps * dist(mt);
}
```

Revision	Date	Description
1.0	December 29, 2017	Initial draft