LETTER OF REFERENCE FOR **Noah Bottie**

Jud Northbark
Department of Big Data,
Football Stadium University,
Allapoosa, New Scrampshire, 12345

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Ms Etta Cettera
Ectoplasmic National Laboratory
ehcettera@enl.gov

Dear Ms Cettera,

Noah Bottie has asked me to submit a letter of recommendation on his behalf for a post-doctoral appointment at your laboratory. I am happy to have the opportunity to assist Noah in making a good start to what I expect to be a long and fruitful career.

I have known Noah for about three years; my first meetings occurred during my visits to FSU, when he would confer with me about questions and problems he was having in his early research. When I myself became an employee in the department in August of last year, I began to work much more closely with him, while he was heavily involved in research and programming associated with his doctoral work.

My first experience with Noah occurred when, during one of my visits, he asked me for help in computing the Delaunay triangulation associated with a set of points on a sphere. This part of his algorithm was being carried out by an "heirloom" FORTRAN program. Noah's timing results suggested that this code was inefficient, and would dominate his computation as the number of points increased. I knew that Delaunay triangulation could be a difficult task even on the plane. And I really didn't have much knowledge about the problem on spheres at all. My response to his question was just a single sentence:

> *According to Steven Fortune, it is possible to compute the Delaunay triangulation of points on a sphere by computing their convex hull.*

I figured that this was all the help I could give him, and that sometime, on a later visit, we could chat further about the implications of this statement. However, an hour later, Noah came to me with a plot exhibiting his first computation of a Delaunay triangulation made by taking advantage of Fortune's insight. He had found a fast convex hull code that scaled well with the number of points and integrated that into his computation, so that the cost of triangulation now fell into line with other costs. I was taken aback at how quickly Noah had seized on my remark, worked out its consequences, implemented a new code and nailed down a confirmatory plot.

Once I took up a permanent job at FSU, I came into daily contact with Noah. Since he was now working on his thesis, our conferences occasionally lasted as long as an hour, as Noah presented the current roadblocks in his effort, and brainstormed with me about how to proceed. Inspired by problems he had encountered during an internship at your laboratory, his thesis aimed at the rapid creation and modification of huge grids on spheres, intended for accurate and efficient climate modeling. Now the problem of efficiency for large problems was even more urgent, and again he was having trouble controlling the cost of the triangulation. The difficulty was that the rest of his code could be parallelized, but the triangulation had to be done by sending information to the convex hull code which computed its result sequentially.

He said he was sure that there must be a way to do the triangulation in parallel. I tried to convince him

that as hard as doing triangulation on a sphere was, a parallel triangulation scheme could only be far, far worse. Noah showed me some ideas he had for doing parallel triangulation in the plane, but no matter how he tried, he couldn't think of how to adjust these ideas so they could be carried out on the surface of the sphere.

But then Noah came back with a new idea. Why not map the sphere to the plane? There, he could use his parallel triangulation idea. At first I thought there was little chance that this would work, but then Noah came across the idea of using spherical projection. Since this process preserves angles, it preserves the Delaunay property between planes and spheres. This meant that, if he was very careful with bookkeeping, he could map sphere points to a plane, divide the plane among multiple processors, triangulate, adjust the triangulation locally, and map the result back to the sphere. Noah was able to plan, implement and demonstrate his new parallel code and he is now writing up this new parallelization idea for a paper.

I chose these anecdotes to make it clear that I feel that Noah is an excellent programmer with good insight into problem solving and a dogged, hard-working intensity. I have enjoyed working with him, and now have had as many occasions to ask him for help as I may have helped him in the past. From my experience with him, I am sure that he will be an active, productive and self-motivated researcher; I think the post-doctoral position he is applying for will be a wonderful first step on a remarkable career.

Sincerely

John Burkardt
jburkardt@FSU.edu