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Normal Maps and Parallax Mapping

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Original coding by Michael Tichenor

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Texture-mapping starts with an interesting image

Let's say that we want to do bump-mapped displacements with these bricks. For certain types of textures, like this one, you could write a program to examine the texture texel-by-texel and come up with an approximate normal vector at each texel and then encode this into another texture image. This is called a **normal map**.

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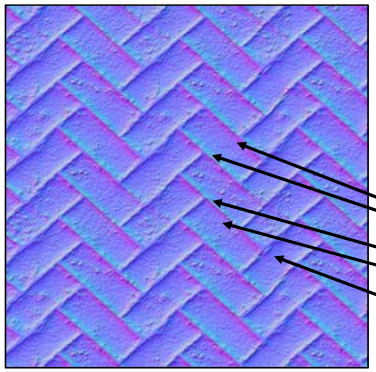
Getting the normals by analyzing the texture – the Normal Map



Red : nx
Green : ny
Blue : nz

Much red: nx ~ +1.
No red: nx ~ -1.

Much green: ny ~ -1.
No green: ny ~ +1.

Much blue: nz ~ +1.

Interpreting this image is a little tricky. Normal vector components run from -1. to +1. But, color channels run from 0. to 1. So, a color value of 0. is needed to correspond to a normal component of -1., and a color value of 1. is needed to correspond to a normal component of +1. In this case, green is encoded upside-down.

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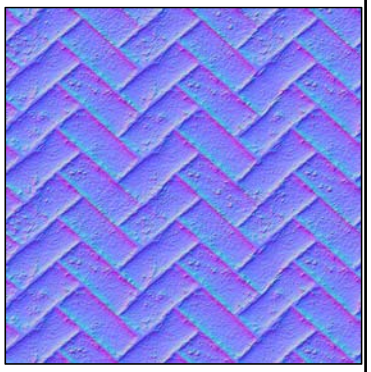
Original Texture Map and Normal Texture Map



We can use the color texture image on top of a surface

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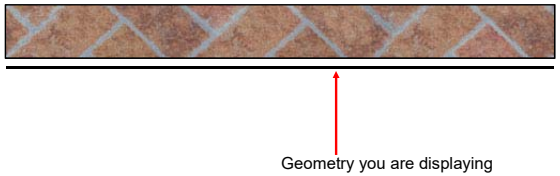

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And then you get something like this

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But, what if the surface really has displacements, but you would only see them if you were using more geometric detail?

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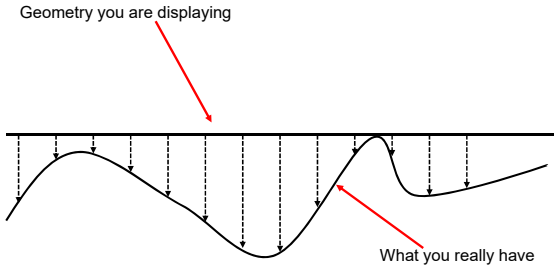

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Even turning on texture-mapping only puts the flat texture on the flat surface

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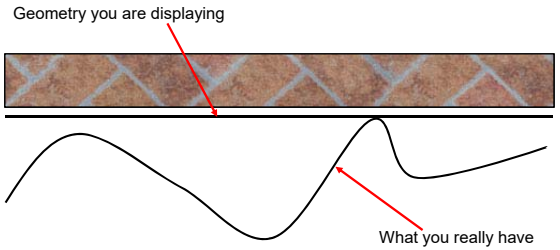

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We could get the normals from the normal map and perform bump-mapping

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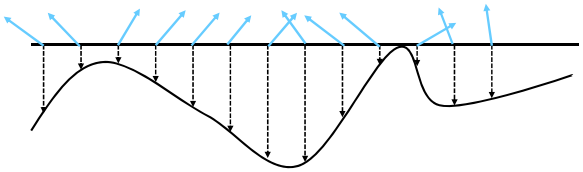

That is good, but . . .

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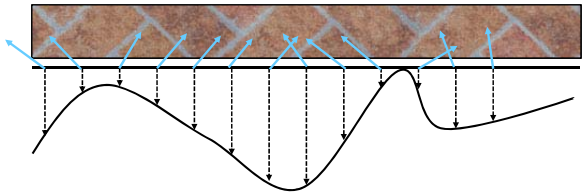

. . . we can do even better – Parallax Mapping

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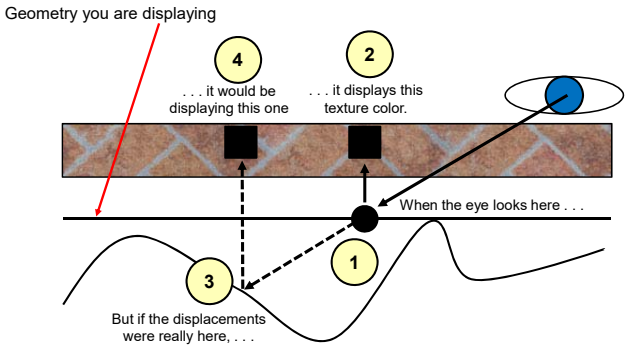

The inner-loop of Parallax Mapping

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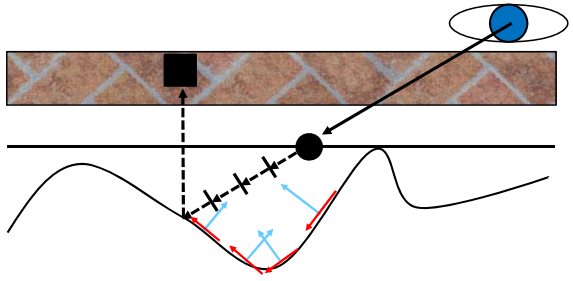

Slopes are perpendicular to the normal map

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Parallax Mapping

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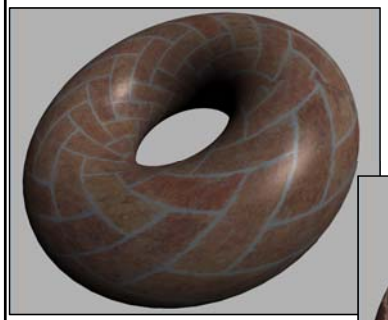

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