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you can use a unit

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vector  $a$  as a reflection operator by employing it in a sandwiching product:  $a x a$  reflects the vector  $x$  in the line of  $a$ . It then follows from the figure that the geometric product of two unit vectors  $R = b a$  fully encodes the rotation as a double reflection.

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Geometric algebra for  
basis blades. Geometric  
algebra for multivectors.  
Factorization, inversion,  
meet and join, exp, sin,  
cos. The reference  
implementation was  
intended for educational  
purposes: the code was  
kept as simple as  
possible, and not  
designed with efficiency  
in mind.

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January 2010: Leo Dorst  
and Joan Lasenby are

organizing an  
international conference

Applications of  
Geometric Applications

in Computer Science  
and Engineering

(AGACSE2010), June  
14-16 in Amsterdam,

The Netherlands. Here

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is the website. For January  
2010: Released working  
GAViewer 0.81 for OS  
X 10.6 (Snow Leopard).

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### Geometric Algebra For Computer Science

Daniel Fontijne is a post-  
doc at the University of  
Amsterdam, currently  
working to apply  
conformal geometric  
algebra to markerless  
motion capture. He

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holds a Master's degree  
in Artificial Intelligence  
and a Ph.D. in

Computer Science, both  
from the University of

Amsterdam. As part of  
his Ph.D. study he

developed Gaigen 2, the  
fastest geometric

algebra implementation  
for low dimensional

spaces ...

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The ray tracer was implemented using conformal geometric algebra. Special attention was paid to run-time efficiency, as we wanted to show that conformal geometric algebra is not slower than traditional approaches. Below you can download the full source code of this ray

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tracer, or view selected parts of the raytracer online. ...

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This is a simple, inefficient geometric algebra implementation written in Java for the purpose of illustrating how to implement the algorithms from the implementation

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chapters. An efficient implementation is discussed in Chapter 22. Ray tracer: Chapter 23 describes in detail how to use geometric algebra to implement a ray tracer in C++.

## Approach To Geometric Algebra For Computer Science

Please send them to  
leo@science.uva.nl. We  
have put time stamps on

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the corrections made since the appearance of the book, to facilitate updating your copy. ...

Pg xix, C.1: change

Peometric to Geometric.

[20070525 EH] Pg xx,

caption of figure 3.3: we mean a 2-blade.

[20070401] Pg xxi,

caption of figure 6.1: we mean Non -invertibility.

...



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## Geometric Algebra For Computer Science

Almost all chapters of the book contain drills, structural exercises and programming exercises.

When we wrote the drills and exercises for Geometric Algebra for Computer Science, we intended them to be for self-study. As such, we are tempted to release solutions to all the drills

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and structural exercises.

## Geometric Algebra For Computer Science

Using geometric algebra, any  $k$ -dimensional linear subspace can be represented as a computational element called a blade, and you won't need the lookup tables anymore because equations will become

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intuitive, simple and generic. In geometric algebra, blades are constructed using the outer product (denoted  $\wedge$ ).

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Geometric Algebra for Computer Science presents a compelling alternative to the limitations of linear

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Geometric algebra provides a rich and general mathematical framework for the development of solutions, concepts and computer algorithms without losing geometric insight into the problem in question.

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Such extended geometrical entities are now basic elements of algebraic computation. We use the blades of a geometric algebra to algebraically represent all geometrical primitives. The scalars in a vector space are represented as 0-blades,



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the vectors by 1-blades,  
and the oriented area  
elements are 2-blades.

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