**Laser Chess™**

Original Article: Mike Duppong
HTML Conversion: Christopher Heckman

A fascinating, futuristic two-player strategy game--our best ever. For the Commodore 64, Apple II, Amiga and Atari XL/XE.

-- Cover, COMPUTE! Magazine, June 1987, Issue 85, Vol. 9, No 6.

 **Introduction**

*Here's a game that's so good that we just had to share it with*COMPUTE!*readers.*Laser Chess™*won First Prize in our $10,000 programming contest for*COMPUTE!*'s Atari ST Disk & Magazine. Awarded $5,000 for its originality and skillful programming,*Laser Chess*is a two-player strategy game patterened after traditional chess--with some fascinating new twists. The original version was written in the Modula-2 language for the Atari ST. Here we have provided BASIC and machine language translations for Amiga, Commodore 64 (and Commodore 128 in 64 mode), Apple II, and Atari XL and XE.*

## *[Note that instructions regarding how the various versions operate have been deleted. This article ha*

## Rules

*Laser Chess*™, as the name implies, is a chesslike strategy game for two players. The goal is to manipulate a laser-firing piece and various reflective objects to eliminate your opponent's king. As in traditional chess, there are an infinite number of ways to accomplish this. ...

There are eight basic types of pieces in *Laser Chess*, and each has unique capabilities. Over time, you'll learn each piece's advantages and limitations. Obviously, the more you play *Laser Chess*, the more you'll understand the pieces in your arsenal, which in turn will make you a better player. So let's start with a description of the pieces.

**A Geometric Army**

The table below shows each piece and its name. ... Notice that some sides of certain pieces are highlighted with a different color. This indicates a reflective surface. When a laser beam strikes a reflective surface, it bounces off without harming the piece. But if a piece is hit by a laser on a nonreflective surface, it is destroyed.

A piece can be removed from the board if it is captured by an opposing piece. This is similar to traditional chess; to capture a piece, you simply move one of your own pieces onto its square.

In addition to their ability to move from square to square, pieces with reflective surfaces can also be rotated in place in 90-degree increments. This lets you orient the piece to protect it against opposing laser shots, or to set up bounce shots with your own laser.

*s also been re-formatted for HTML. --CCH]*

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| **Name** | **Image(s)** | **Important information** |
| King | http://www.public.asu.edu/~checkma/laserchess/RK.bmp  | The king is the most important piece in *Laser Chess*. When the king is eliminated, the other player wins the game. Since it has no reflective surfaces, it can be destroyed by a laser from any angle. It can also be captured by an opposing piece. The king is not totally defenseless, however. It can capture any opposing piece by moving onto its square. But you can use it for a capture only once per turn. |
| Laser | http://www.public.asu.edu/~checkma/laserchess/RL0.bmp http://www.public.asu.edu/~checkma/laserchess/RL1.bmphttp://www.public.asu.edu/~checkma/laserchess/RL2.bmp http://www.public.asu.edu/~checkma/laserchess/RL3.bmp | The second most important piece is the laser. This piece is your primary offensive weapon; it's the only piece which can fire a laser shot. To take aim, you can rotate it in place at 90-degree angles. Like the king, the laser is completely vulnerable to enemy laser strikes, because it has no reflective surfaces. If you lose your laser, the game is not over, but only the most skillful (or incredibly lucky) player can overcome its loss. |
| Hypercube | http://www.public.asu.edu/~checkma/laserchess/RH.bmp  | The hypercube is an interesting piece. It can't harm an opposing piece directly, but may very well do so indirectly. When the hypercube is moved onto another piece (even your own), that piece disappears from its original position and reappears on a randomly selected empty square. This can happen only once per turn. The hypercube can be a two-edged sword; it may relocate a piece to a vulnerable position, or it may make it possible for the piece to capture an important opposing piece on the next move. The hypercube has no reflective surfaces and cannot be rotated. It is invulnerable to laser shots, however, because it's made of transparent material--a laser beam passes right through it. Remember that. |
| Beam Splitter | http://www.public.asu.edu/~checkma/laserchess/RS0.bmp http://www.public.asu.edu/~checkma/laserchess/RS1.bmphttp://www.public.asu.edu/~checkma/laserchess/RS2.bmp http://www.public.asu.edu/~checkma/laserchess/RS3.bmp | The beam splitter is another tricky piece. When a laser beam strikes a splitter's vertex (the point opposite its base), the beam splits in two. The two new beams travel in opposite directions, perpendicular to the original beam's path. When a laser shot hits one of the beam splitter's reflective surfaces, it bounces off at a 90-degree angle *without* splitting. If the beam splitter's base it hit by a laser shot, it is destroyed. The beam splitter can be rotated. |
| Blocks | http://www.public.asu.edu/~checkma/laserchess/RB0.bmp http://www.public.asu.edu/~checkma/laserchess/RB1.bmphttp://www.public.asu.edu/~checkma/laserchess/RB2.bmp http://www.public.asu.edu/~checkma/laserchess/RB3.bmp | The blocks are fairly simple pieces. However, they may impose some complex situations. A block can capture any opposing piece by moving onto that piece's square, much like a king. But unlike a king, a block has one reflective side and can be rotated as the situation demands. Therefore, blocks can be used offensively or defensively. A laser beam that hits the reflective surface of a block is deflected 180 degrees--bouncing the beam back where it came from. |
| Diagonal Mirror | http://www.public.asu.edu/~checkma/laserchess/RD0.bmp http://www.public.asu.edu/~checkma/laserchess/RD1.bmp | A diagonal mirror cannot be destroyed by a laser, because both of its sides are reflective. Diagonal mirrors can be removed from the board only when captured by a block or a king. When a laser beam strikes a diagonal mirror, the beam is deflected 90 degrees. Diagonal mirrors can be flipped to their opposing diagonal, but cannot be rotated to face horizontally or vertically. |
| Horizontal and Vertical Mirrors | http://www.public.asu.edu/~checkma/laserchess/RM0.bmp http://www.public.asu.edu/~checkma/laserchess/RM1.bmp | The horizontal mirrors and vertical mirrors (known collectively as straight mirrors) are also invulnerable to lasers due to their reflective surfaces. When a laser hits a straight mirror edgewise, the beam passes through it. Straight mirrors can be rotated to become either horizontal or vertical mirrors, but not diagonal mirrors. |
| Triangular mirrors | http://www.public.asu.edu/~checkma/laserchess/RT0.bmp http://www.public.asu.edu/~checkma/laserchess/RT1.bmphttp://www.public.asu.edu/~checkma/laserchess/RT2.bmp http://www.public.asu.edu/~checkma/laserchess/RT3.bmp | The triangular mirrors deflect laser beams just as diagonal mirrors do, but they are vulnerable to hits on their two nonreflective sides. A triangular mirror can be rotated in 90-degree increments. |

**Making Moves**

As in the conventional game of chess, a move in *Laser Chess* consists of moving or otherwise manipulating a game piece. ... The same player always moves first in *Laser Chess*. There's no particular advantage or disadvantage to moving first.

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| http://www.public.asu.edu/~checkma/laserchess/RT1.bmp | http://www.public.asu.edu/~checkma/laserchess/RB1.bmp | http://www.public.asu.edu/~checkma/laserchess/RB1.bmp | http://www.public.asu.edu/~checkma/laserchess/RM1.bmp | http://www.public.asu.edu/~checkma/laserchess/RM0.bmp | http://www.public.asu.edu/~checkma/laserchess/RS3.bmp | http://www.public.asu.edu/~checkma/laserchess/RB1.bmp | http://www.public.asu.edu/~checkma/laserchess/RB1.bmp | http://www.public.asu.edu/~checkma/laserchess/RT0.bmp |
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The starting position of the pieces

A turn consists of two moves. ... Moving a distance of one square takes one move; moving two squares takes two moves, although you can move a piece two squares in one step. Since you have only two moves per turn, the maximum distance a piece can be moved in one turn is two squares. ... Pieces can be moved forward, backward, left, or right, but not diagonally. You can effectively move a piece diagonally by using two moves--forward and right, for instance.

You cannot move a piece onto a square occupied by another piece. The only exceptions are captures with blocks and kings, and moves of the hypercube as described above.

**Rotating A Piece**

[If a piece is selected and rotated], the piece rotates 90 degrees (one quarter-turn) clockwise. You may continue rotating the piece to any desired position before deselecting it. Rotating a piece to face any direction takes only one move, and the move is subtracted after the piece is deselected. ... You can combine a rotation and a move in a single action. First, select the piece, then rotate the piece in the direction you wish it to face. Finally, move to any adjacent square (except a diagonal) as you would normally do. The piece moves to that square and faces in the direction you've chosen. Since rotating a piece and moving a piece each take one move, this uses up your turn.

**Special Features**

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| http://www.public.asu.edu/~checkma/laserchess/BH.bmp | At the center of the 9x9 board is a special square called a hypersquare. It absorbs laser beams and acts like a stationary hypercube. That is, if you try to move a piece onto it, the piece disappears from the original position and reappears on a randomly selected empty square. This can happen only once per turn, however. ... |

**Firing The Laser**

... When it's your turn, you can select ... to fire your laser. Firing your laser takes only one move, but can be done only once per turn. Therefore, you may want to use your first move in a turn to aim the laser, rotate a reflecting piece to set up a bounce shot, or move another piece into position.

Of course, you won't necessarily be firing the laser on every turn. Much of the strategy in *Laser Chess* involves moving and rotating your pieces to set up complex shots. It's important to realize that *any* laser hit on a piece's nonreflective or nontransparent surface will destroy that piece. You can destroy your own pieces just as easily as you can destroy your opponent's. You can even zap your own laser, particularly if you fire directly into the 180-degree reflective surface of a straight mirror or block, or if you fail to anticipate the effects of a beam splitter. Be forewarned.

**Laser Chess Strategy**

As in the conventional game of chess, much of the strategy in *Laser Chess* revolves around thoughtful placement of your pieces. However, the character of the game differs from that of chess in many ways. The laser, for example, can strike at long distances and in more than one direction at once. And the hypercube adds an extra element of uncertainty. The best strategy for any particular game depends to a great extent on the skill and personality of your opponent. However, there are some general tips you may find helpful.

Get your mirrors out early. Use them to gain the fullest potential of your laser. Try to position mirror networks on both sides of the beam splitter so you can inflict as much damage as possible.

Take advantage of the blocks. Since they ``control'' an area around them with their threat of capture, no other pieces can safely move within their range. Make your opponent work to displace them. Remember to rotate the reflective side of a block to the most probable direction of laser fire. If you can prevent a laser from destroying the block, your opponent will most likely have to gang up on it with two or more of his or her own blocks.

Use mirrors to protect your king. If you surround your king with straight and diagonal mirrors, there is no way it can be hit by a laser. Therefore, your opponent will have to break through your defense with blocks. (This is a pretty dirty trick, because when all of your opponent's blocks have been used, your king is almost invulnerable.) Defending your king with blocks is also a good strategy.

The hypercube should be used sparingly, since you have no idea where a relocated piece will reappear. Most players use the hypercube as a last resort--if another piece is going to be destroyed anyway, it doesn't hurt to take a chance and relocate it with the hypercube. Also, if your opponent's king is encircled with mirrors, you can march right in with your king with your hypercube, followed by a block. This tactic may displace your opponent's defense, forcing him to evacuate the king from its mirrored fortress. Escorting the hypercube with an adjacent block prevents the opponent from attacking the hypercube with his or her king. Your opponent's only options will be to flee or be displaced.

**Instructions for the VP version**

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| **VP Laser Chess Controls** |
| P | Start a new game |
| Arrow keys | Move the cursor around the board, if no piece has been selected.If a piece has been selected, move the piece in that direction. |
| Enter | Select/deselect piece |
| + | Rotate piece clockwise (if one has been selected) |
| - | Rotate piece counterclockwise (if one has been selected) |
| F | Fire laser |
| Q | End game |

* The respective keys on the numeric keypad will also work; i.e., you can move the cursor around the board by pressing the 2, 4, 6, and 8 keys, etc.
* When you select a piece (by pressing Enter), the cursor will begin to flash. Press Enter to deselect the piece, or press one of the arrow keys to move it. Once you have moved a piece one square, the piece is unselected automatically. Rotating a piece then moving it will count as two moves (unless the piece is rotated to its original orientation). If you have one move left in your turn and try to move a rotated piece, you will be notified that you have made an illegal move.
* Currently, there is no way to record moves. (1) I am working on notation (based on the algebraic notation used in chess), which will automatically be written as a game is played. (2) I also plan to allow games to be read in and played. Right now (April 2003), (1) and (2) are in the development stages.
* Currently (April 2003), the only option is 2 human players. A 1-player game (versus the computer) may be possible as an option in the future.

**Notation**

While debugging version 0.1 of Laser Chess, I developed a notation based on descriptive notation in chess.

* Each square is given a letter and a number, with the letters going from left to right (from Red's point of view) and the numbers going bottom to top (again from Red's point of view). For instance, the Green Laser starts on d9, and the blue hypercube is at e5.
* When a piece moves from one square to another, this is notated as: (start square)–(end square); for instance **a2–a3** means the Red Triangle Mirror moves up one square.
* If a piece moves onto the blue hypercube square (e5), the square it is teleported to is put after the move, in parentheses, like: **d5–e5(g2)**.
* If a King or a Block moves on to a square already occupied by a piece, that piece is captured. An x is used instead of a – to indicate this: **e2xe3**.
* If a Hypercube moves onto a square already occupied by a piece, that piece is teleported, and the destination square is put in parentheses: **h4–h5(i8)**. Note that a – (hyphen) is used, not an x.
* If a piece is rotated, then the square that piece is on is recorded, followed by one of: (–) (counter-clockwise/widdershins rotation of 90 degrees); (2): rotation by 180 degrees; (+) (clockwise/deosil rotation of 90 degrees). For instance, **f1(+)** rotates the laser 90 degrees clockwise.
* The word **Laser** is used when the laser is fired.
* Moves are separated using a comma (,) between moves by the same player, and a colon (:) is used to separate moves by different players. The move number is placed before Red's first move. For example, here was the start of a game that was causing the bug I mentioned: