00:00:00,580 --> 00:00:28,870

[Muziki]

00:00:28,870 --> 00:00:31,519

habari na karibu kwa mada hii

00:00:31,519 --> 00:00:32,640

juu ya John Conway

00:00:32,640 --> 00:00:35,910

Mchezo wa Maisha

00:00:35,910 --> 00:00:35,920

Mchezo wa maisha ni

00:00:35,920 --> 00:00:37,750

Mchezo wa maisha ni otomatiki ya rununu

00:00:37,750 --> 00:00:37,760

otomatiki ya seli

00:00:37,760 --> 00:00:41,590

ilivumbuliwa na mwanahisabati wa Cambridge

00:00:41,590 --> 00:00:41,600

John Conway

00:00:41,600 --> 00:00:45,510

Mchezo huu una mkusanyiko wa

seli

00:00:45,510 --> 00:00:45,520

seli

00:00:45,520 --> 00:00:48,320

kwa kuzingatia sheria chache za hisabati

00:00:48,320 --> 00:00:51,430

Seli zinaweza kuishi,

00:00:51,430 --> 00:00:55,189

seli zinaweza kufa,

00:00:55,189 --> 00:00:58,709

au kuzidisha

00:00:58,709 --> 00:00:59,760

Kulingana na hali ya awali,

00:00:59,760 --> 00:01:03,270

seli huunda mifumo mbalimbali

00:01:03,270 --> 00:01:05,109

katika kipindi chote cha mchezo.

00:01:05,109 --> 00:01:06,479

Sasa hebu tuangalie sheria za mchezo.

00:01:06,479 --> 00:01:09,750

Mchezo huu una sheria 4 ambazo

00:01:09,750 --> 00:01:12,789

kuamua ikiwa seli inaishi,

00:01:12,789 --> 00:01:12,799

au kufa.

00:01:12,799 --> 00:01:15,190

Yote inategemea

00:01:15,190 --> 00:01:16,320

juu ya ni majirani wangapi wa seli hiyo wako hai

00:01:16,320 --> 00:01:19,670

Kanuni ya kwanza;

00:01:19,670 --> 00:01:19,680

Juu ya kuzaliwa

00:01:19,680 --> 00:01:23,040

Sasa, siku ya **kuzaliwa kwa seli**,

00:01:23,040 --> 00:01:26,479

**Kila seli iliyokufa karibu na majirani watatu hai**

00:01:26,479 --> 00:01:30,230

**itakuwa live katika kizazi kijacho**

00:01:30,230 --> 00:01:30,240

*kwa mfano*

00:01:30,240 --> 00:01:32,560

Wacha tutumie gridi hapa,

00:01:32,560 --> 00:01:33,360

Kwa kutumia njano post yake

00:01:33,360 --> 00:01:36,390

kuwakilisha seli hai,

00:01:36,390 --> 00:01:36,400

hakuna post yake

00:01:36,400 --> 00:01:38,870

kuwakilisha seli iliyokufa,

00:01:38,870 --> 00:01:39,759

na chapisho la bluu

00:01:39,759 --> 00:01:42,640

kupigia mstari kiini kilichozaliwa

00:01:42,640 --> 00:01:44,000

ambayo basi inakuwa tu

00:01:44,000 --> 00:01:47,280

seli ya kawaida katika njano

00:01:47,280 --> 00:01:48,310

*kwa mfano*

00:01:48,310 --> 00:01:48,320

ikiwa tuna seli

00:01:48,320 --> 00:01:52,310

Katika usanidi huu

00:01:52,310 --> 00:01:52,320

**Kanuni inasema hivyo**

00:01:52,320 --> 00:01:55,600

**Kila seli iliyokufa karibu na majirani watatu hai**

00:01:55,600 --> 00:01:58,079

**itakuwa live katika kizazi kijacho.**

00:01:58,079 --> 00:02:00,799

Sasa katika kesi hii majirani wanamaanisha

00:02:00,799 --> 00:02:03,990

kushoto kulia,

00:02:03,990 --> 00:02:04,000

juu, hadi chini

00:02:04,000 --> 00:02:07,429

na diagonal.

00:02:07,429 --> 00:02:08,000

Katika usanidi huu sisi tu

00:02:08,000 --> 00:02:11,280

kuwa na jirani mmoja aliyekufa yaani

00:02:11,280 --> 00:02:13,599

karibu na majirani watatu hai

00:02:13,599 --> 00:02:15,840

na hiyo hapa

00:02:15,840 --> 00:02:18,560

kwa hivyo tuna mtoto mmoja aliyezaliwa

00:02:18,560 --> 00:02:19,589

ambayo baadaye inakuwa hai

00:02:19,589 --> 00:02:19,599

katika kizazi kijacho.

00:02:19,599 --> 00:02:23,110

Sheria inayofuata

00:02:23,110 --> 00:02:23,120

**kifo kwa kutengwa**

00:02:23,120 --> 00:02:25,910

*inasema kwamba*

00:02:25,910 --> 00:02:28,879

**Kila seli hai iliyo na jirani mmoja au wachache hai itakufa katika kizazi kijacho.**

00:02:28,879 --> 00:02:32,470

Sasa, hebu tuangalie kiini jirani

00:02:32,470 --> 00:02:35,920

seli moja hai

00:02:35,920 --> 00:02:38,239

huku majirani waliobaki wakiwa wamekufa.

00:02:38,239 --> 00:02:41,350

Kutumia kanuni,

00:02:41,350 --> 00:02:41,360

seli hii,

00:02:41,360 --> 00:02:45,680

hufa kwa sababu imetengwa.

00:02:45,680 --> 00:02:47,350

kwa sababu kuna seli mbili tu zilizo hai

00:02:47,350 --> 00:02:47,360

Kwa sababu kuna seli mbili tu zilizo hai

00:02:47,360 --> 00:02:48,800

kwenye bodi na moja tu

00:02:48,800 --> 00:02:51,120

jirani kuishi,

00:02:51,120 --> 00:02:53,190

na hakuna seli zilizokufa

00:02:53,190 --> 00:02:53,200

ambayo yangeweza kuwa nayo

00:02:53,200 --> 00:02:55,270

majirani watatu hai,

00:02:55,270 --> 00:02:55,280

Hakutakuwa na kuzaliwa

00:02:55,280 --> 00:02:57,440

hata na seli moja kwenye ubao

00:02:57,440 --> 00:03:00,869

na majirani sifuri maisha.

00:03:00,869 --> 00:03:00,879

Kwa hivyo usanidi wote wa kuanzia

00:03:00,879 --> 00:03:02,400

na pekee

00:03:02,400 --> 00:03:05,910

seli moja

00:03:05,910 --> 00:03:05,920

mapenzi tu

00:03:05,920 --> 00:03:09,200

vyenye seli zilizokufa katika kizazi kijacho

00:03:09,200 --> 00:03:11,830

kwa sababu ya kutengwa.

00:03:11,830 --> 00:03:11,840

Hebu tuangalie

00:03:11,840 --> 00:03:13,910

kwa

00:03:13,910 --> 00:03:13,920

*kanuni ya tatu*

00:03:13,920 --> 00:03:15,990

**Kifo kwa Msongamano**

00:03:15,990 --> 00:03:16,000

Kanuni hii inasema,

00:03:16,000 --> 00:03:20,319

**Kila seli hai yenye majirani wanne au zaidi wanaoishi**

00:03:20,319 --> 00:03:23,750

itakufa katika kizazi kijacho kana kwamba kwa msongamano wa watu

00:03:23,750 --> 00:03:23,760

*kwa mfano:* ***hii***

00:03:23,760 --> 00:03:25,830

Kutumia kanuni,

00:03:25,830 --> 00:03:27,280

Seli mpya inazaliwa hapa kwa sababu

00:03:27,280 --> 00:03:29,920

ina majirani watatu haswa hai

00:03:29,920 --> 00:03:32,000

wakati seli hii inakufa kwa sababu ina nne

00:03:32,000 --> 00:03:34,789

majirani wanaoishi,

00:03:34,789 --> 00:03:34,799

sawa na seli hii hapa

00:03:34,799 --> 00:03:37,040

kwa sababu ina majirani wanne walio hai

00:03:37,040 --> 00:03:40,400

na seli mpya inazaliwa hapa kwa sababu ina tatu

00:03:40,400 --> 00:03:44,480

kuishi majirani.

00:03:44,480 --> 00:03:53,190

Kufuatia sheria, seli hii hufa kwa sababu ya kutengwa -

00:03:53,190 --> 00:03:56,319

ilikuwa na jirani mmoja tu aliye hai

00:03:56,319 --> 00:03:58,159

Sawa na seli hii hapa

00:03:58,159 --> 00:04:01,589

Katika kizazi kijacho chembe mpya huzaliwa hapa

00:04:01,589 --> 00:04:03,840

kwa sababu ina majirani watatu walio hai

00:04:03,840 --> 00:04:06,959

huku seli hii ikifa kwa sababu ya kutengwa

00:04:06,959 --> 00:04:09,439

Sawa na hii

00:04:09,439 --> 00:04:13,190

na usanidi wetu mpya ni huu

00:04:13,190 --> 00:04:13,200

Katika usanidi huu maalum

00:04:13,200 --> 00:04:14,789

kuendelea na kanuni,

00:04:14,789 --> 00:04:14,799

tukiendelea na kanuni tunafahamu hilo

00:04:14,799 --> 00:04:17,359

tunajua kwamba wote wanakufa katika kizazi kijacho

00:04:17,359 --> 00:04:20,239

**Mbona?**

00:04:20,239 --> 00:04:21,600

Kwa sababu katika kesi hii kila seli itakuwa tu

00:04:21,600 --> 00:04:24,390

kuwa na upeo wa jirani mmoja aliye hai

00:04:24,390 --> 00:04:29,189

hakutakuwa na kuzaliwa kwa kuwa kuna chembe hai chini ya tatu

00:04:29,189 --> 00:04:36,479

Kwa hivyo usanidi wote wa awali utakufa katika kizazi hiki cha mwisho.

00:04:36,479 --> 00:04:40,070

na

Hii hapa ni **kanuni ya nne**

00:04:40,070 --> 00:04:40,080

**Kuishi**

00:04:40,080 --> 00:04:43,919

Kanuni hii inasema,

00:04:43,919 --> 00:04:50,469

**kila seli hai iliyo na majirani wawili au watatu hai itasalia moja kwa moja kwa kizazi kijacho**

00:04:50,469 --> 00:04:51,350

*kwa mfano*

00:04:51,350 --> 00:04:51,360

usanidi huu

00:04:51,360 --> 00:04:54,720

Katika usanidi huu kila seli ina majirani watatu hai;

00:04:54,720 --> 00:05:00,870

Kiini cha kwanza hapa kina mbili, tatu na nne kama majirani

00:05:00,870 --> 00:05:04,390

Seli mbili hapa ina moja, tatu na nne kama majirani,

00:05:04,390 --> 00:05:04,400

sawa na

00:05:04,400 --> 00:05:07,600

Seli nne iliyo na seli tatu, moja na mbili na sawa kwa seli ya 3

00:05:07,600 --> 00:05:10,320

na muhimu zaidi

00:05:10,320 --> 00:05:12,950

Sheria hizi zote zinatumika

00:05:12,950 --> 00:05:13,990

kwa seli zote

00:05:13,990 --> 00:05:14,000

wakati huo huo

00:05:14,000 --> 00:05:16,870

Kwa hivyo tunayo;

00:05:16,870 --> 00:05:16,880

**Kuzaliwa kana kwamba kwa uzazi**,

00:05:16,880 --> 00:05:20,310

**Death by isolation as if by underpopulation**,

00:05:20,310 --> 00:05:22,880

**Death by overcrowding as if by our population,**

00:05:22,880 --> 00:05:26,390

na

00:05:26,390 --> 00:05:26,400

**Kuishi**

00:05:26,400 --> 00:05:30,560

Now, let's see what these simple rules can do

00:05:30,560 --> 00:05:33,199

Given a configuration like this:

00:05:33,199 --> 00:05:37,189

What do you think is going to happen to these cells?

00:05:37,189 --> 00:05:39,199

These cells can either be alive with tokens in

00:05:39,199 --> 00:05:42,390

or dead with no tokens in.

00:05:42,390 --> 00:05:42,400

In computer versions,

00:05:42,400 --> 00:05:49,749

live cells are represented by one color and dead cells by another or just a blank grid

00:05:49,749 --> 00:05:52,710

In theory,

00:05:52,710 --> 00:05:57,120

the size of the cell or the grid is infinite but small boards will do for the initial play

00:05:57,120 --> 00:06:03,749

This is a solitary game or one with just one player and the play of the typical game looks like this

00:06:03,749 --> 00:06:15,350

You can pause the video and try out this configuration by yourself

00:06:15,350 --> 00:06:15,360

[PAUSE]

00:06:15,360 --> 00:06:18,400

Let's apply the rules

00:06:18,400 --> 00:06:20,240

Things start to get more interesting here

00:06:20,240 --> 00:06:25,430

Starting with the initial setup here then

00:06:25,430 --> 00:06:25,440

We move on to the next generation

00:06:25,440 --> 00:06:27,120

and we apply the rules

00:06:27,120 --> 00:06:41,919

Most configurations of three are far enough apart that they die out in one or two generations

00:06:41,919 --> 00:06:44,240

but this is an exception

00:06:44,240 --> 00:06:49,110

Starting with the line of three cells,

00:06:49,110 --> 00:06:52,309

the two end cells will die because they had one neighbor each

00:06:52,309 --> 00:06:57,120

While the middle cell will survive because it had two live neighbors

00:06:57,120 --> 00:07:07,749

There will be two births and the new configuration in the next generation will be this

00:07:07,749 --> 00:07:15,270

The births occur in the two cells next to the surviving cell that were dead because

00:07:15,270 --> 00:07:21,029

each those positions is next to the three live starting positions

00:07:21,029 --> 00:07:23,280

This pattern will repeat in every second generation

00:07:23,280 --> 00:07:31,039

With the two end cells dying and new cells are born

00:07:31,039 --> 00:07:43,670

From a horizontal line to a vertical line of three

00:07:43,670 --> 00:07:46,150

The pattern is called a **blinker**

00:07:46,150 --> 00:07:49,749

While this one, as we had looked before it becomes stable

00:07:49,749 --> 00:07:58,080

Pause the video and try out yourself

00:07:58,080 --> 00:08:01,589

Kutumia kanuni,

00:08:01,589 --> 00:08:06,070

The two live cells here die because of isolation

00:08:06,070 --> 00:08:09,270

We will remain with one live cell in the next generation

00:08:09,270 --> 00:08:16,000

The remaining live cell died because of isolation because the cells were further in the initial configuration

00:08:16,000 --> 00:08:23,280

While with this pattern a new cell is born here because it has exactly two live neighbors while this cell will die

00:08:23,280 --> 00:08:26,550

together with this because of isolation

00:08:26,550 --> 00:08:31,840

Giving us this arrangement in the next generation while this also reduces to nothing

00:08:31,840 --> 00:08:36,790

All the cells die because of isolation

00:08:36,790 --> 00:08:44,949

Now, how about a configuration like this called a **glider**

00:08:44,949 --> 00:08:44,959

[PAUSE]

00:08:44,959 --> 00:08:48,720

Now, stop the video here and try applying the rules

00:08:48,720 --> 00:08:56,470

You can also try the first steps of the glider here pausing the video

00:08:56,470 --> 00:08:56,480

[PAUSE]

00:08:56,480 --> 00:09:08,230

Applying the rules a new cell is born here and here while this cell dies of isolation and this one

00:09:08,230 --> 00:09:09,200

Giving this as the next generation

00:09:09,200 --> 00:09:22,000

In the following generation a new cell is born here and here well this cell dies because of overcrowding and this one dies because of isolation

00:09:22,000 --> 00:09:25,200

Resulting to this as the new configuration

00:09:25,200 --> 00:09:33,590

In the following generation a new cell is born here while this cell dies because of overcrowding same to this one because of overcrowding

00:09:33,590 --> 00:09:38,000

Sorry the first one here dies because of isolation

00:09:38,000 --> 00:09:45,279

a new cell is born here while this one dies because of isolation

00:09:45,279 --> 00:09:48,959

and this is the resulting configuration of the next generation

00:09:48,959 --> 00:09:52,080

Now, let us have a look at this cell in a computer version

00:09:52,080 --> 00:10:08,470

type in [***https://www.silvergames.com/en/game-of-life***](https://www.silvergames.com/en/game-of-life) at your computer

00:10:08,470 --> 00:10:09,269

then play full screen

00:10:09,269 --> 00:10:13,760

Use the control run to show what exists on the screen and set step to show step by step

00:10:13,760 --> 00:10:18,800

You can also use clear to clear the previous

00:10:18,800 --> 00:10:28,230

represent the trace of the dead cells

00:10:28,230 --> 00:10:45,360

Now these are the steps of a glider from this to this to this base to this with the pattern repeating itself back and forth

00:10:45,360 --> 00:10:51,120

Same pattern releasing itself now we can run to show how it glides on the screen

00:10:51,120 --> 00:10:57,590

Now that is how interesting these rules apply

00:10:57,590 --> 00:10:57,600

Have a look at the pattern

00:10:57,600 --> 00:11:00,240

Thanks for watching

00:11:00,240 --> 00:11:06,720

Try for yourself

Have fun