Nikhil Murthy A new SF gun

Aim: To develop a new gun for a SF/fantasy FPS. It should:

- Be usable in at least most situations, without being overpowered.
- Fun.
- Implementable with the resources given.
- New enough to bring in new players.
- Not be a machine gun.

Assets:

- Good and usable physics engine.
- Good art staff.
- No limit to time frame or technology.

Limitations:

- No machine guns.
- Excessive gore should be avoided.

Solution:

This gun is called the high-velocity projectile repulsion system, or if you prefer the shield projector. The shield itself is a translucent green rectangle capable of blocking bullets.

The basic gameplay consists of:

- A shield is projected by the player between the player and the enemy gunmen.
- This shield stops, or even reflects bullets shot at the player by the enemies.
- Thus, the player can hold enemy fire while his teammates kill the enemy, or the player himself can come in close enough to use effective close range attacks, or even bludgeon the enemy with the shield.

Working of the gun:
(or, a simple 12th grade physics class)

If you are allergic to 12th Grade physics, or a small bit of calculus, I will put this simply as the shield slows down bullets and uses energy to do so. When the shield projector runs out of energy, then the shield collapses. However, if there is a good physics engine, I may as well use physics to determine how exactly this works (although this may make the engine redundant, as that is what it is for).

This is written assuming that the game loop consists of a set number of frames per second and bullets are instantiated.

At the beginning, the gun contains a set amount of energy.

At any point, the bullet will have a set velocity and mass. It will also be a certain distance from the

shield. These quantities are termed v, m, and r. A force (F) will be applied by the gun on the bullet such that F=k/(r^2). The bullet will then experience a negative acceleration, thus, v=v-F/m (as F=m*a, by Newton's second law of motion).

Now, work done (W)=F*d where d is the distance covered. Now, as the time period we take is small (due to the high number of frames per second), we can take the velocity to be constant over he interval, despite the fact that we are reducing it, and take W=F*v*(1/n) where n is the number of frames per second, and so (1/n) is the time taken in each frame.

Of course, if more precision is wanted, then:

dW=f*dr (where d represents a differential)

dr=v*dt (where t is the time)
F=m*dv/dt

So, dW=m*(dv/dt)*v*dt
dW=m*v*dv
Therefore, W=m*(v^2)/2 – m*(u^2)/2 (integrating both sides with the limits of u to v, where u is the initial velocity, and v the final velocity, which is u-F/m)

This is obviously the change in kinetic energy of the bullet, which must be done by the gun, by conservation of energy, and I could have said that in the beginning, saving you the calculus, but I like deriving it this way.

So, finally, by simplifying the above,
W=u*F-(F^2)/2*m

The modulus of this is subtracted from the energy of the gun.

Note: The closer the bullet comes, the greater the force applied, thus causing a greater retardation, but also taking more energy. This increases, until, if a bullet touches the shield, the force becomes infinite, stopping the bullet, and simultaneously collapsing the shield.

In addition to the above power consumption, every moment the shield is up, it consumes energy E=k*(SA)*r, where k is a constant, SA is the surface area of the shield, and r is the distance of the shield from the player.

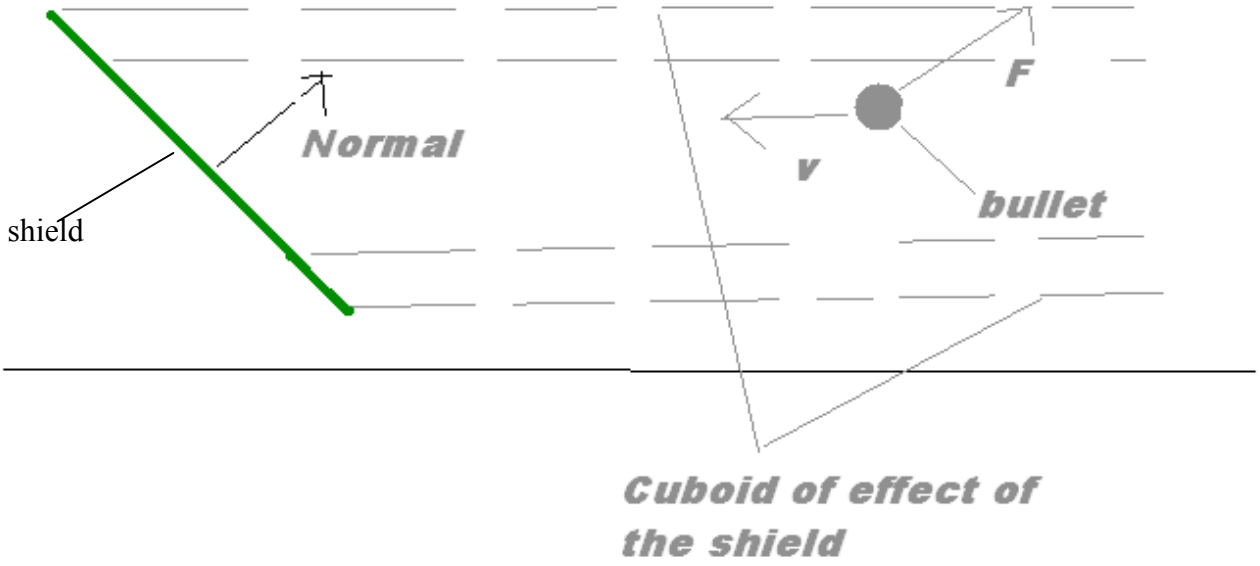
When the energy of the gun becomes zero, the shield collapses. However, the energy replenishes when the gun is not in use.

Stages of the projector:

- Stage 1- bullet blocking: Here, the shield can only block bullets. This stage is really only to get the player used to the weapon and its function in screening others from enemy fire, and running away.
- Stage 2 – bullet reflection: Now, the weapon becomes much more useful, as bullets shot at the

player will, instead of just stopping, be reflected back, protecting the player and reducing the number he has to face.

Note:



When the force is applied, it is applied in the direction of the normal to the plane. However, the force is only applied to particles in the above shown cuboid of effect, which comprises of the height and width of the shield and the positive x-axis. Thus, it only affects bullets directly in front of the shield, and not at an angle.

- Stage 3 – Soul sucking: In this stage, the shield can regain energy by absorbing organic material ranging from enemy soldiers to animals and plants to wooden furniture to the player's teammates. This is done by the shield flash burning the material (this requires an animation, but as there is a good art staff, this isn't too much of a problem) and then absorbing the energy produced which is proportional to the volume of the object burnt. The flash burn animation would preferably be a bright flash, avoiding gore.
- Stage 4 – Body suit: Here, the shield covers the player's entire body, making him bulletproof while the shield lasts. Due to the stage 3 attribute, the player can recharge his suit by coming into contact with an enemy soldier.
- Stage 5 – Dimension changing: Here, the shield's dimensions and distance of projection can be changed, allowing use of a larger or smaller shield as required, thus changing power rates. Also, by variable distance of projection, this becomes an effective one-hit kill recharging rifle.

Of course, if desired a player can always change the mode to a previous stage.

Weaknesses:

- Machine guns would rip this apart due to the high rate of fire, which would quickly drain the

shield's energy.

- Enemies would probably spread around the player, thus negating the shield.
- The body suit would consume excessive amounts of energy due to the high surface area.
- When used as a shield, it has a very low range as an offensive weapon, but when used as the rifle, it has minimal defensive power, as the size must be small so as to conserve power.