

Velocity and Speed

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The **velocity** is the vector quantity that contains the magnitude (speed) and the direction of an Entity,
while the **speed** is the scalar quantity containing the magnitude of the velocity, measured in distance divided by time. (units/second)

As you know, every Entity has a .velocity vector, and from this vector we can extract the speed of an entity.

To get the velocity from a player, we simply use:

```
local.velocity = local.player.velocity; // assuming local.player is a Player Entity
```

Then, to get the speed we use the following formula (Pythagorean theorem):

```
local.speed = sqrt(pow local.velocity[0] 2 + pow local.velocity[1] 2);
```

This will return the player's speed relative to the X and Y axis (North, South, East and West) in units per second.

This can be used to get the walking/running speed of a player

If we want to convert the speed from units/s to a real life unit like feet/s or meters/s we can do the following:

```
local.unit["ft"] = 0.0625; // 1/16 = 0.0625
local.unit["mt"] = 0.01905; // (1/16) * 0.3048 = 0.01905
local.unit["cm"] = 1.905; // (1/16) * 30.48 = 1.905

local.ft_speed = local.speed * local.unit["ft"]; // feet/second
local.mt_speed = local.speed * local.unit["mt"]; // meters/second
local.cm_speed = local.speed * local.unit["cm"]; // centimeters/second
```

Now if for some reason we want to get the speed relative to the X, Y and Z axis (North, South, East, West, Up and Down)

we simply add the value of the Z axis in the velocity vector to the speed formula:

```
local.speed = sqrt(pow local.velocity[0] 2 + pow local.velocity[1] 2 + pow local.velocity[2] 2);
// or alternatively
local.speed = vector_length local.player.velocity;
```

This can be used to show the speed of a flying Entity

A simple demo script:

```
local.unit["ft"] = 0.0625; // 1/16
local.unit["mt"] = 0.01905; // (1/16) * 0.3048 = 0.01905
local.unit["cm"] = 1.905; // (1/16) * 30.48 = 1.905

// assuming local.player is a Player Entity
while (local.player) {
    local.velocity = local.player.velocity;

    local.speed = sqrt(pow local.velocity[0] 2 + pow local.velocity[1] 2);

    local.ft_speed = local.speed * local.unit["ft"];
    local.mt_speed = local.speed * local.unit["mt"];
    local.cm_speed = local.speed * local.unit["cm"];

    local.player iprint("");
    local.player iprint("velocity: " + local.velocity);
    local.player iprint("speed: " + string(int(local.speed)) + " u/s");
    local.player iprint("speed: " + string(int(local.ft_speed)) + " ft/s");
    local.player iprint("speed: " + string(int(local.mt_speed)) + " mt/s");
    // local.player iprint("speed: " + string(int(local.cm_speed)) + " cm/s");
    waitframe;
}
```

How it looks in-game:

<https://www.youtube.com/watch?v=voaAAQfMBt0>