The UX of Google Earth VR

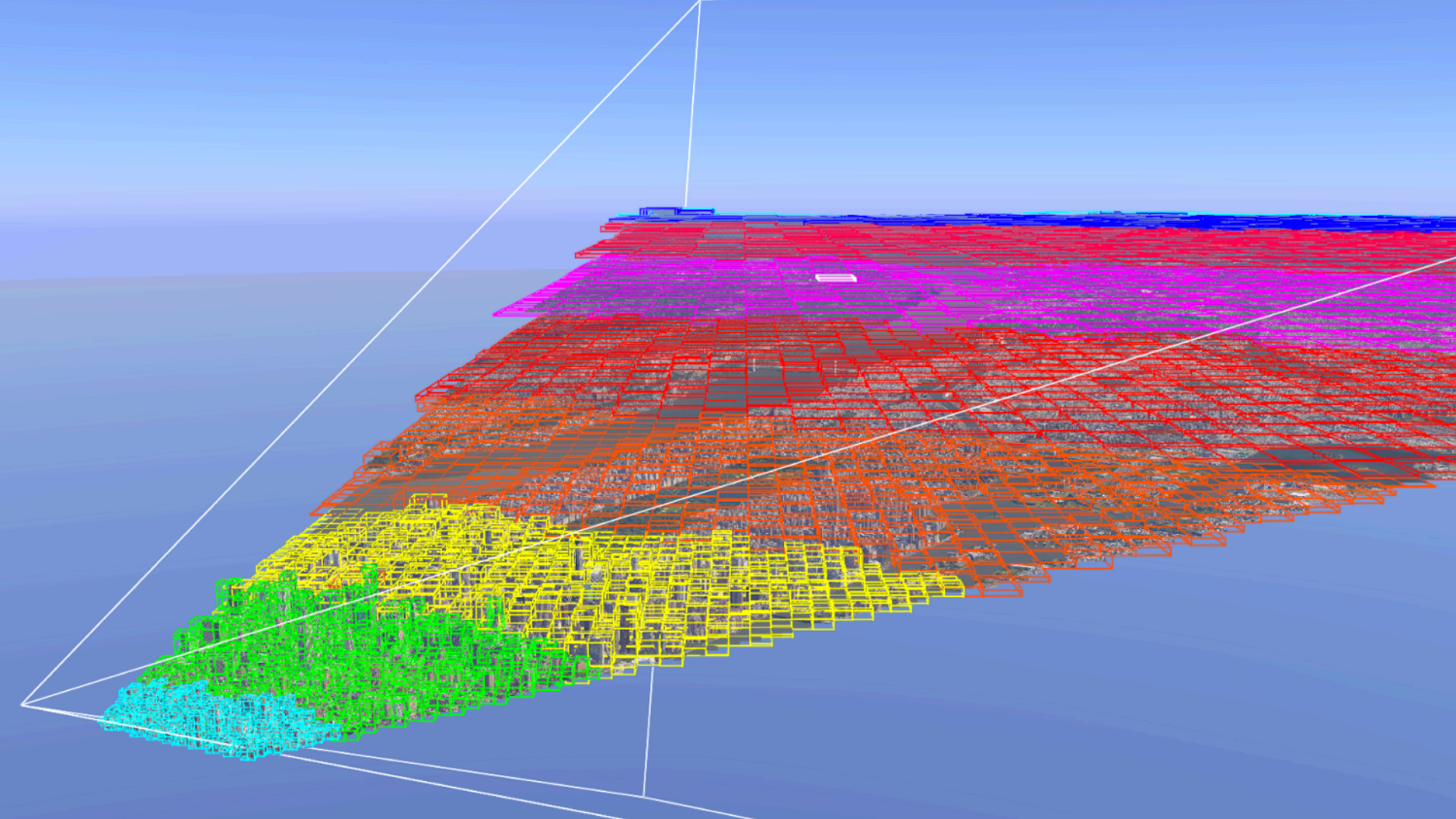
Adam Glazier, Per Karlsson, Nadav Ashkenazi

Background

Adam Glazier

@AdamGlazier

10 milliseconds per frame



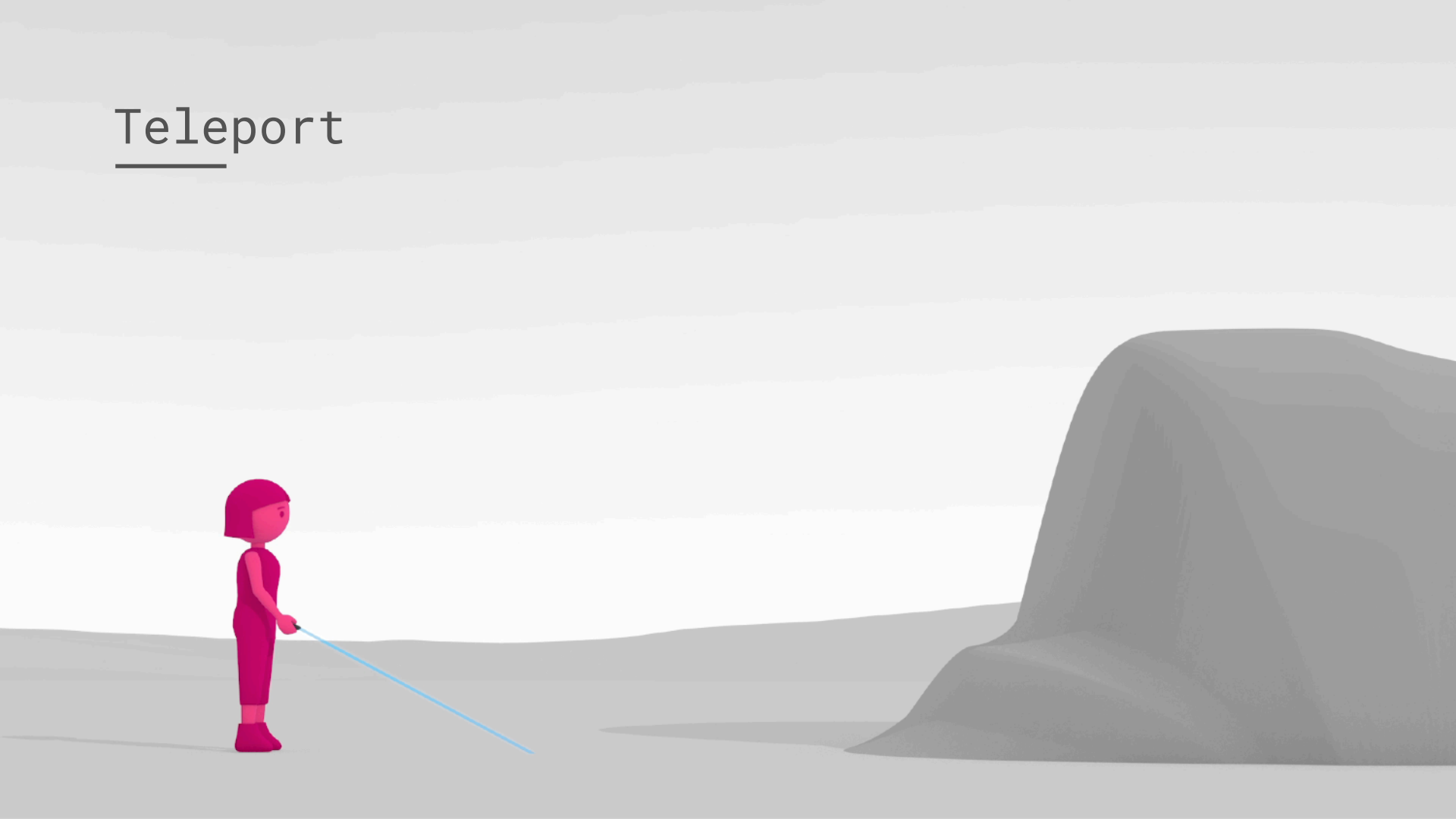
2016 SIGGRAPH Talks

“Bringing Google Earth to virtual reality”

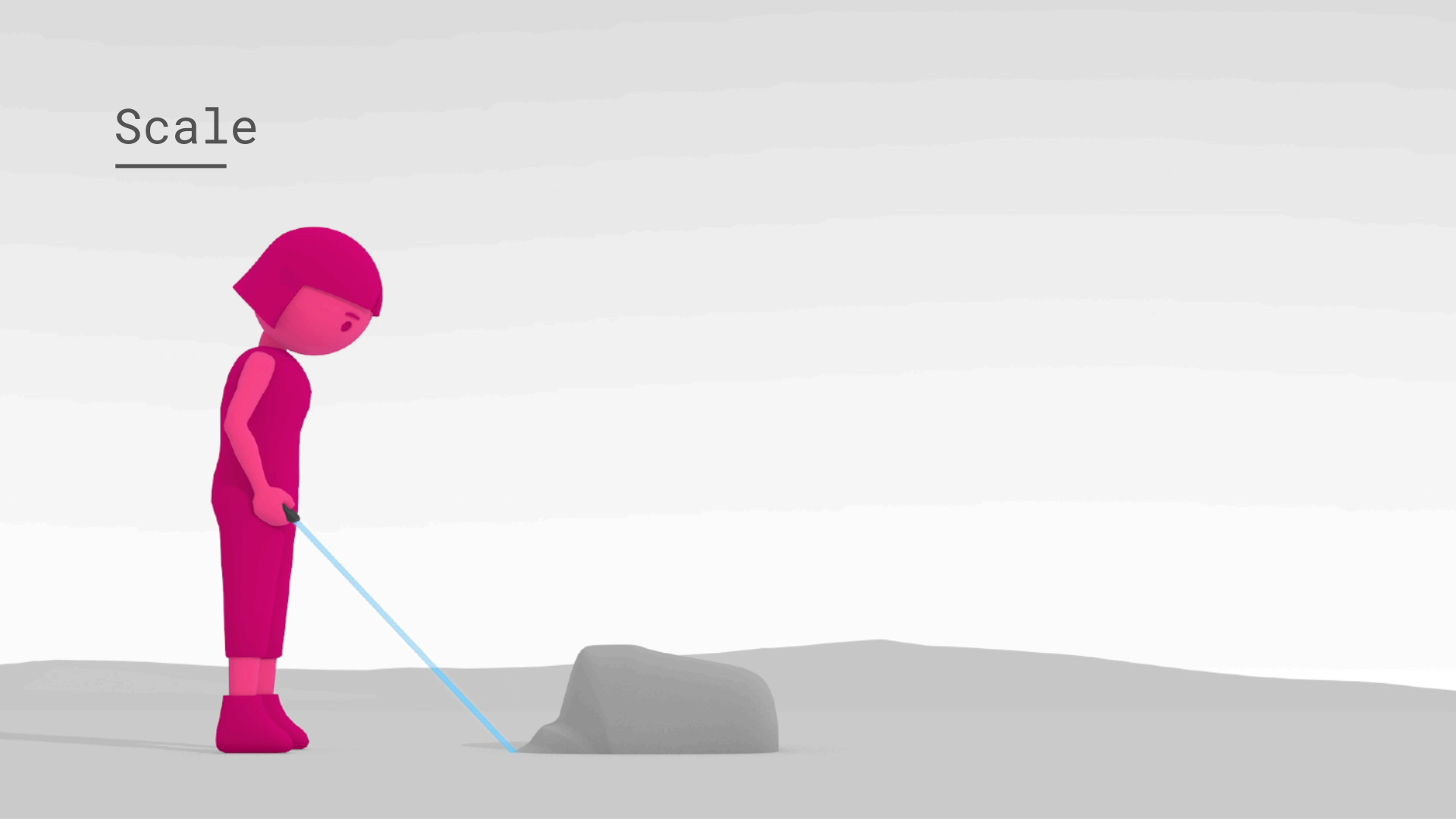
– Dominik Kaeser, Matthias Buhlmann

Navigation

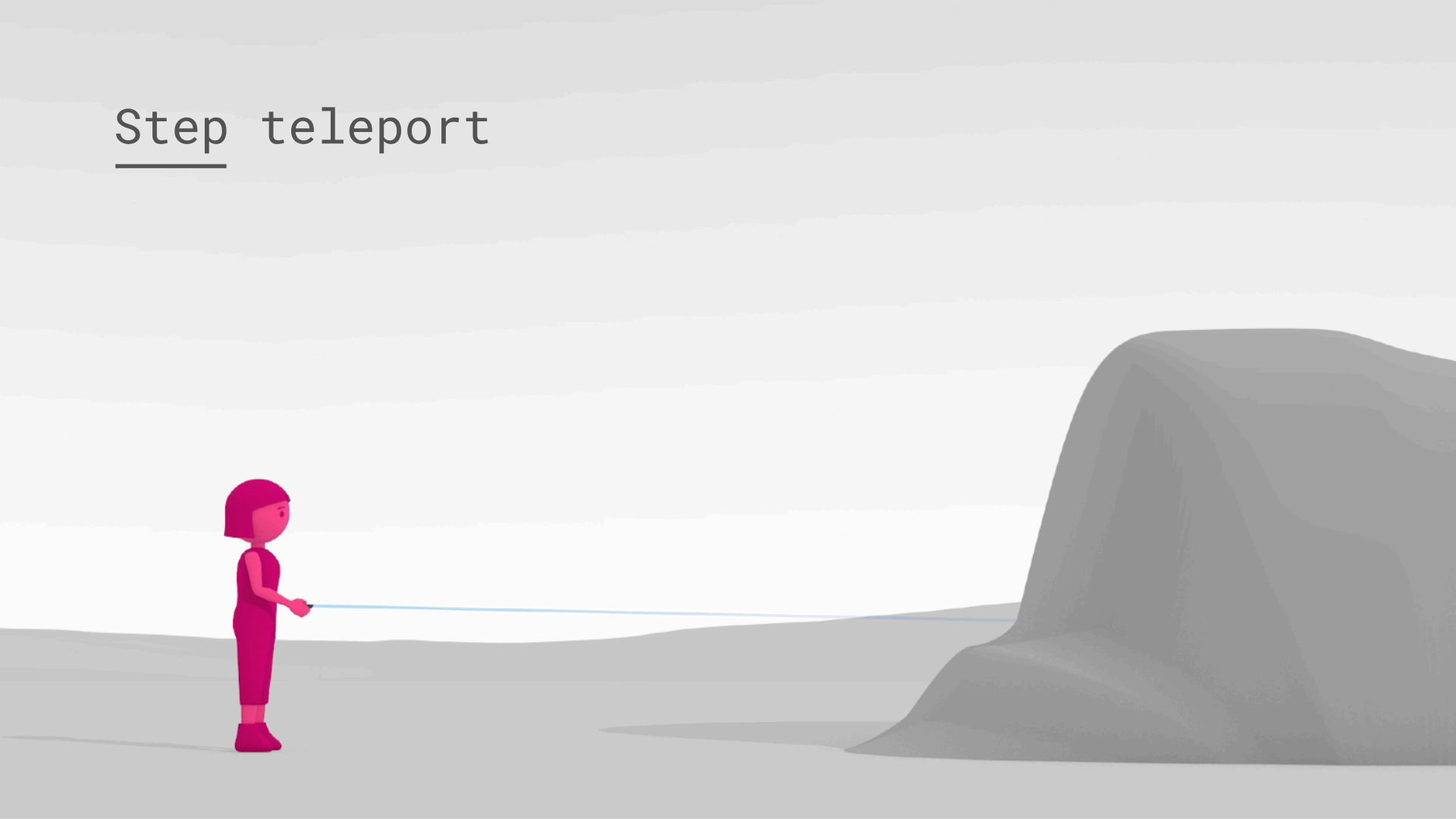
Teleport



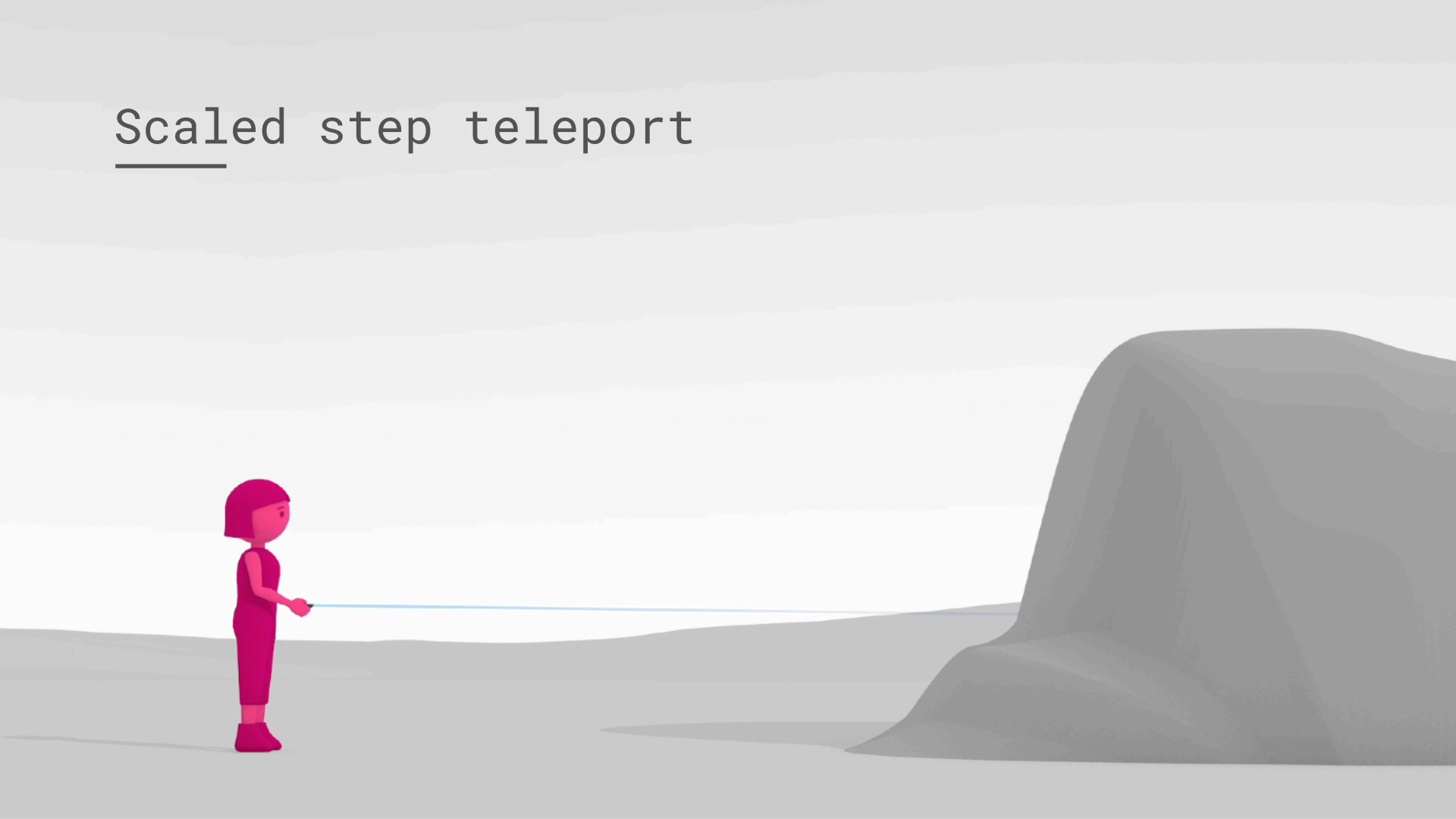
Scale



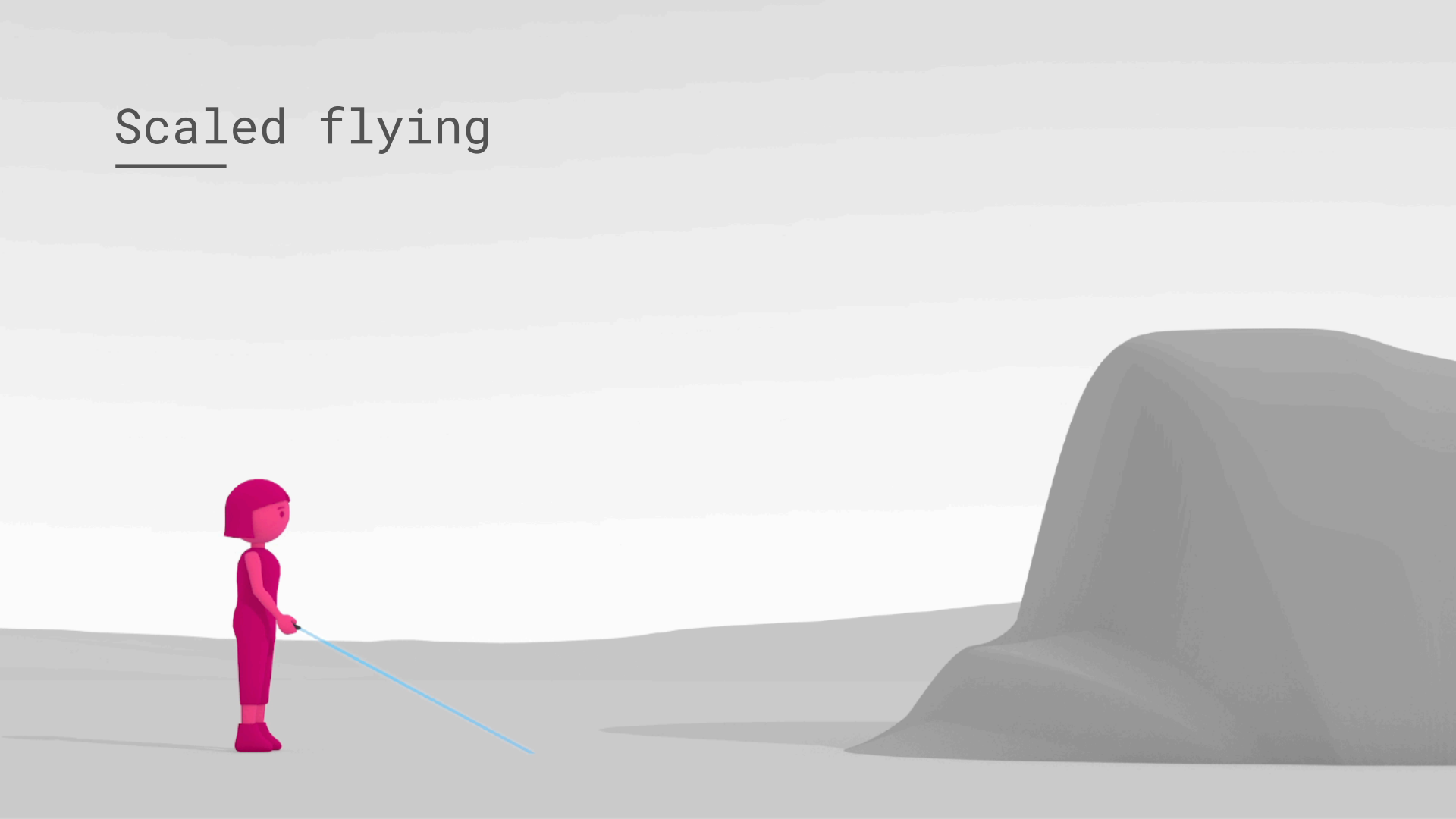
Step teleport



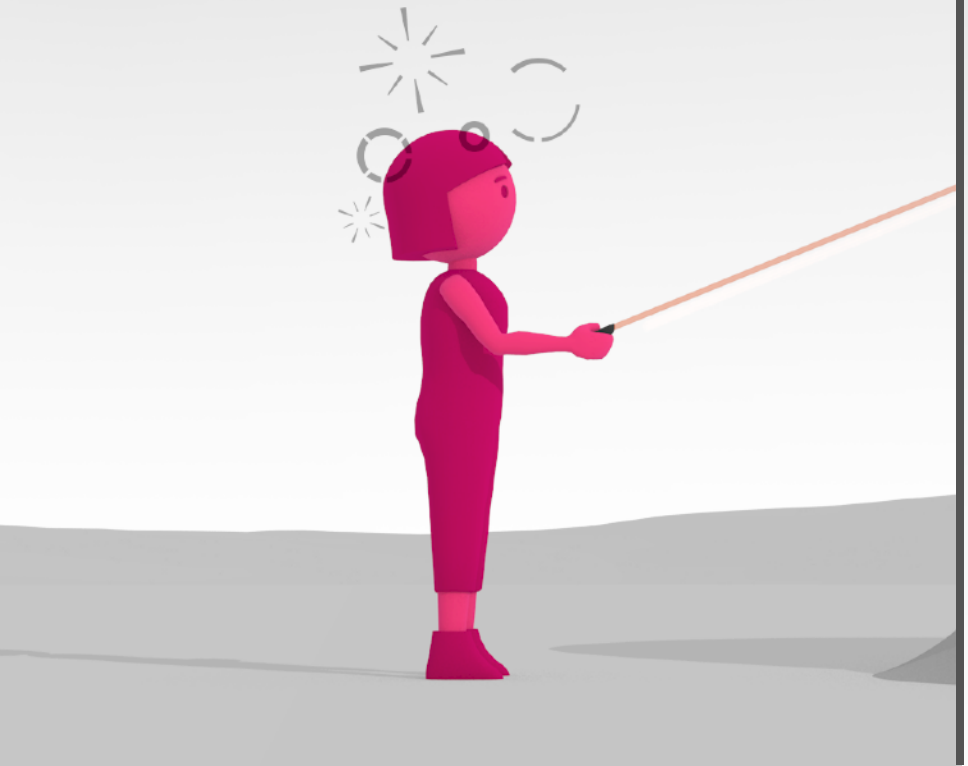
Scaled step teleport



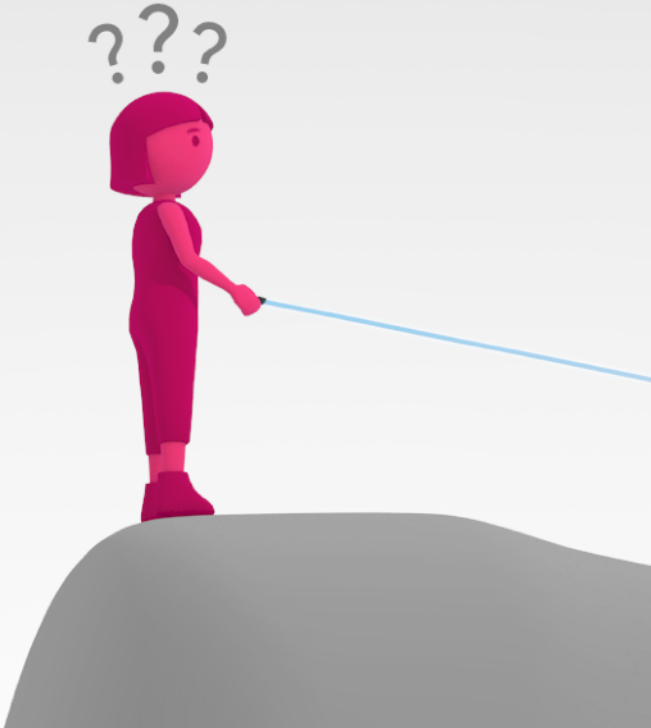
Scaled flying

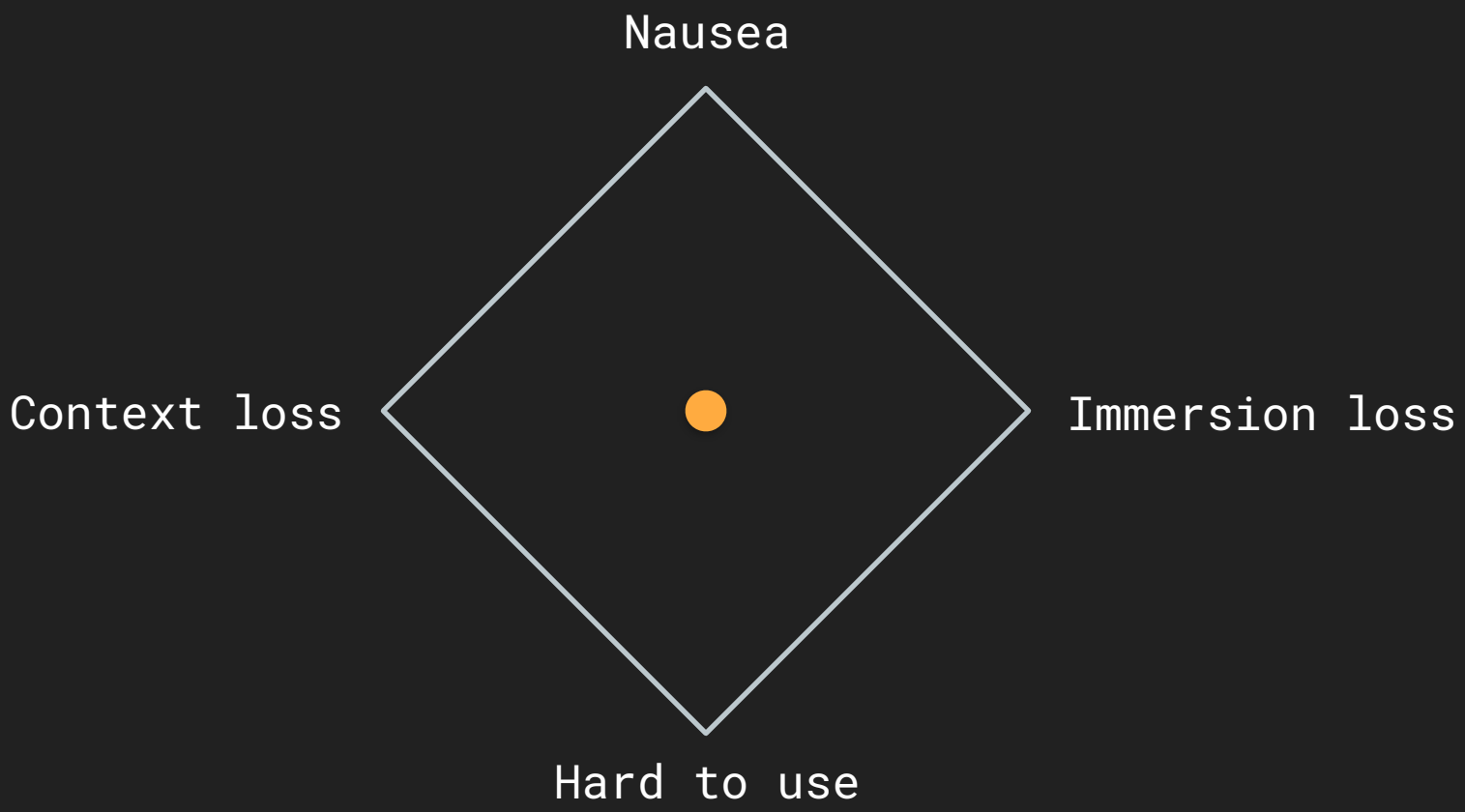


Flying = **Nausea**

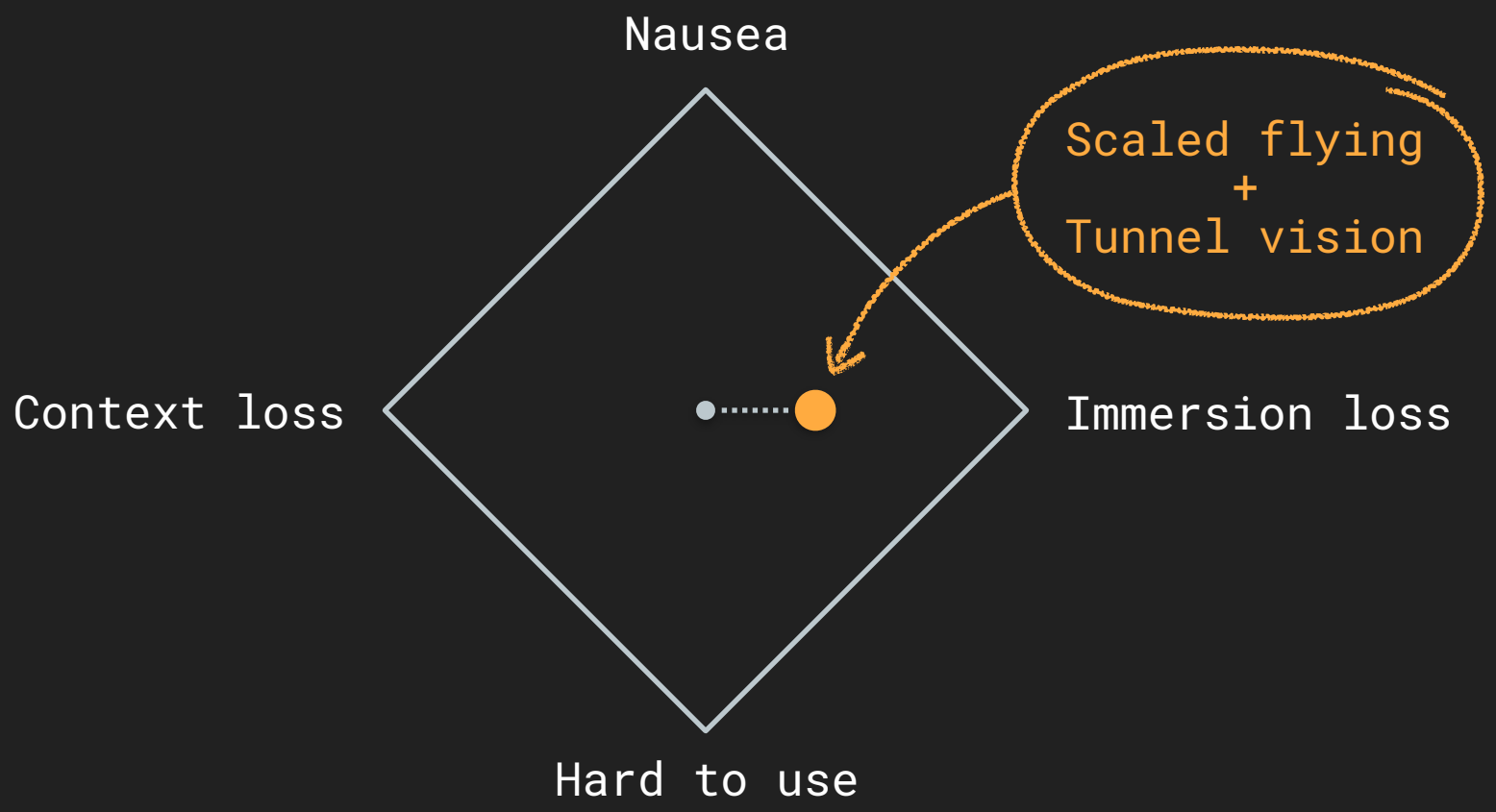


Teleport = **Context loss**

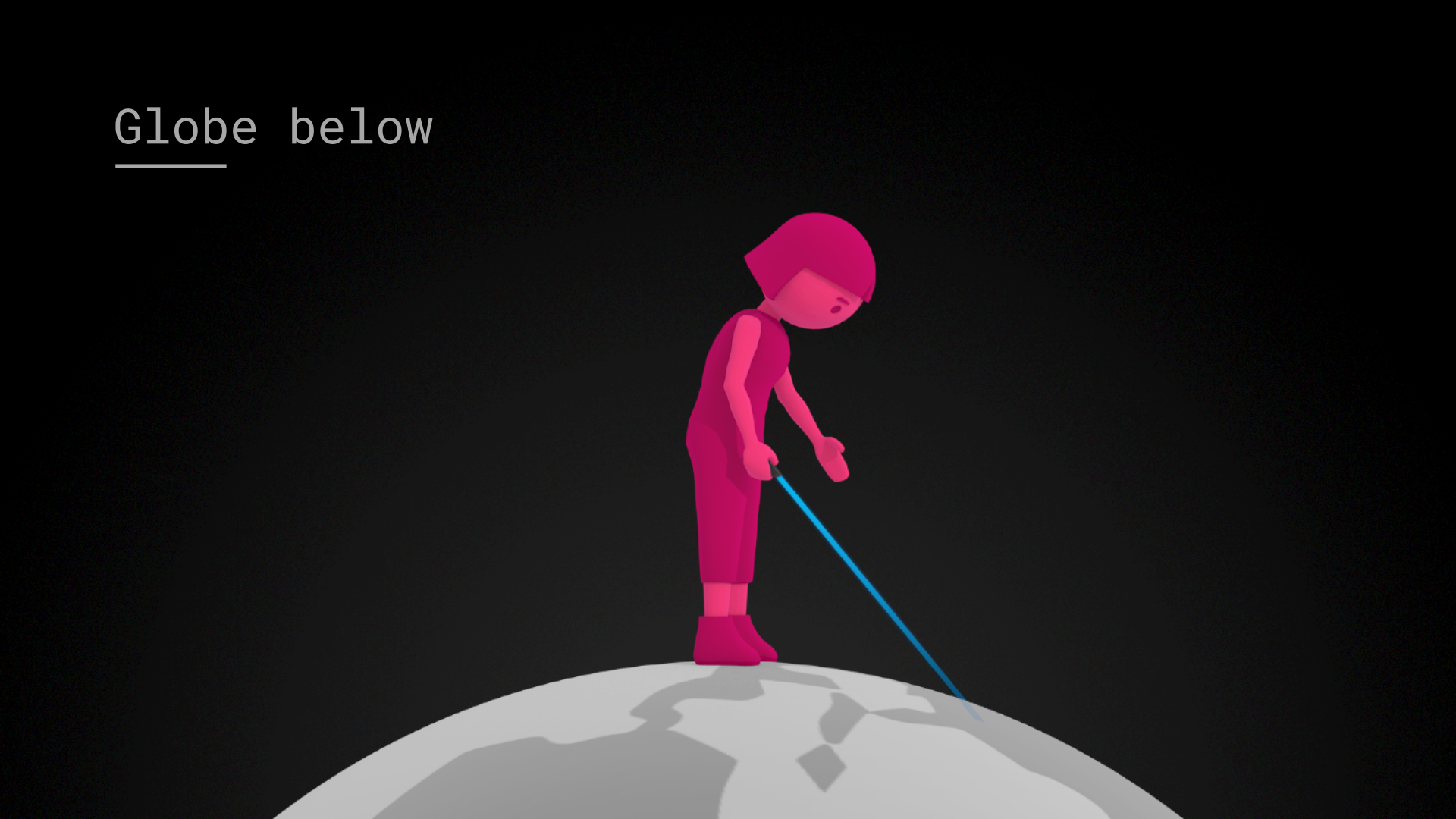



Nausea
Context loss
Immersion loss
Hard to use

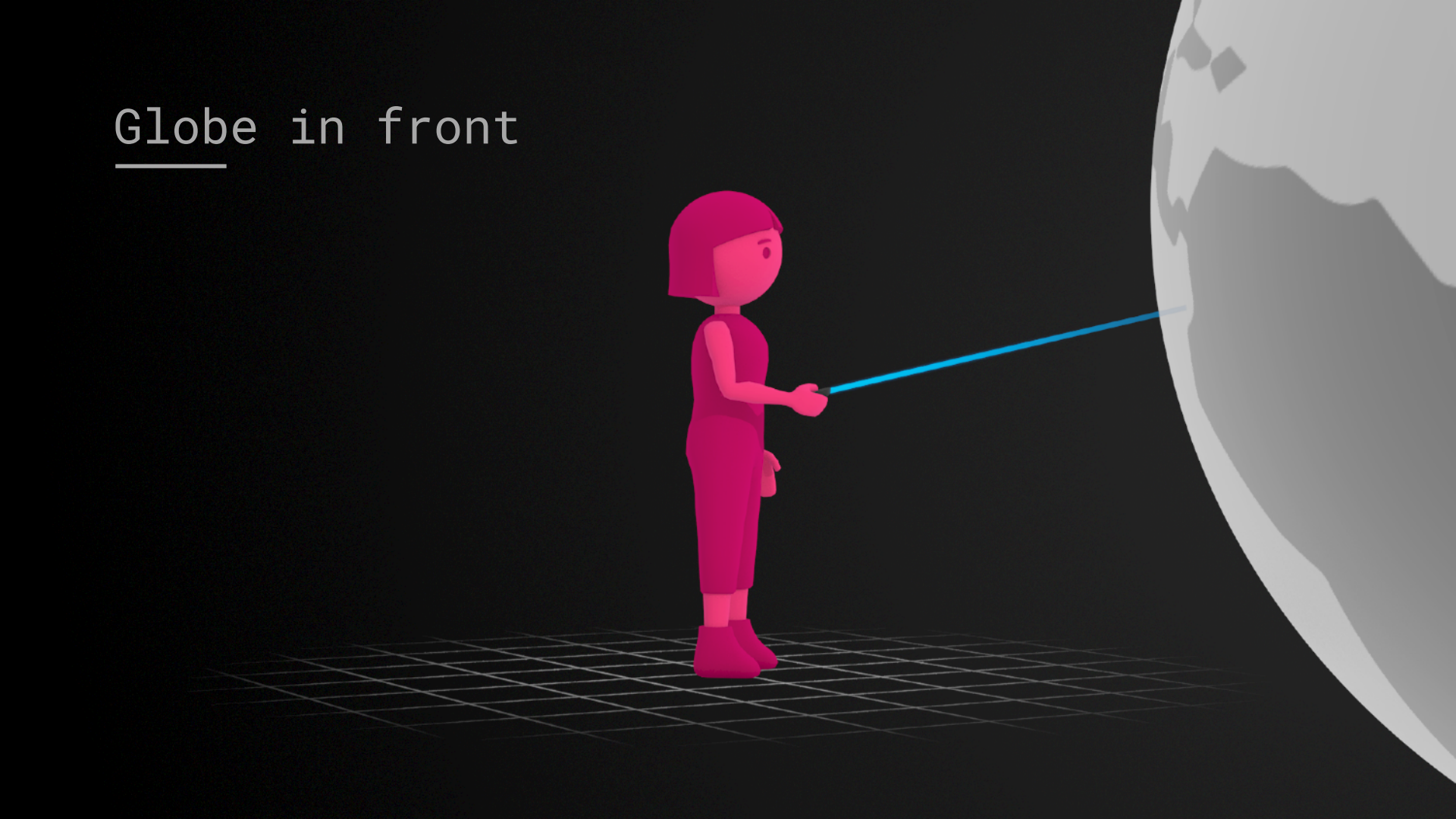
Tunnel Vision


Nausea
Scaled flying
+
Tunnel vision
Context loss
Immersion loss
Hard to use

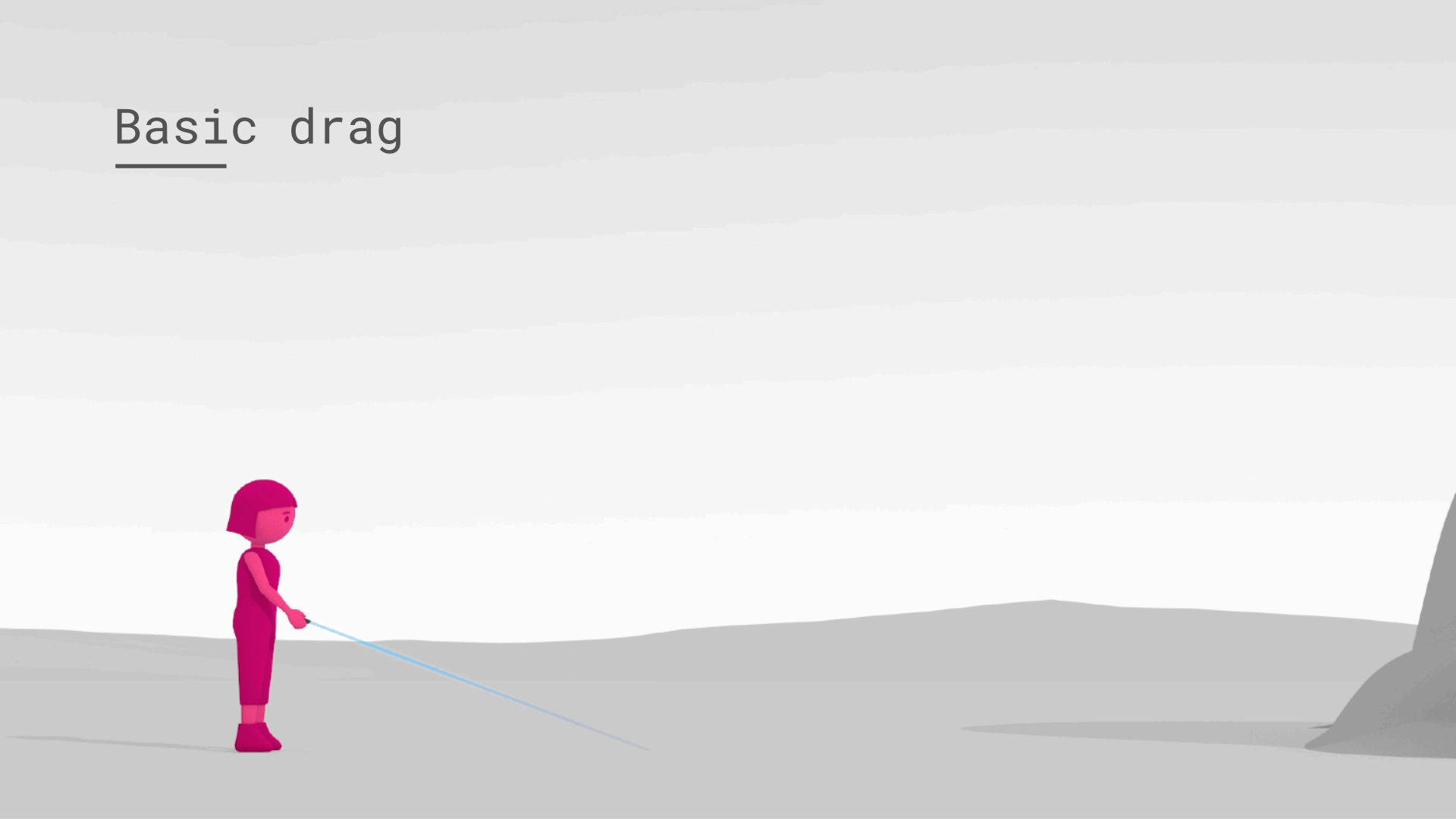
Globe below



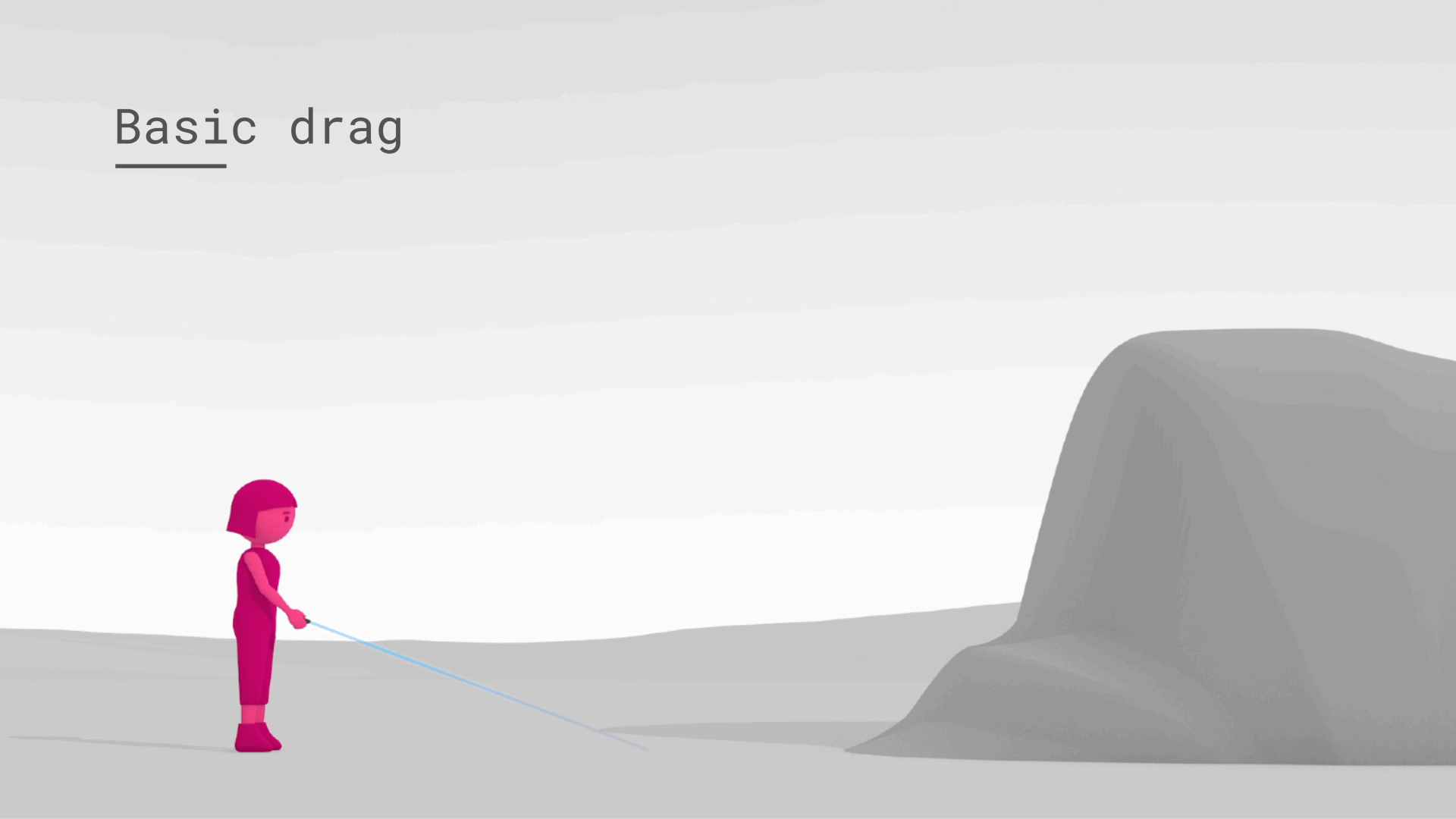
Globe in front



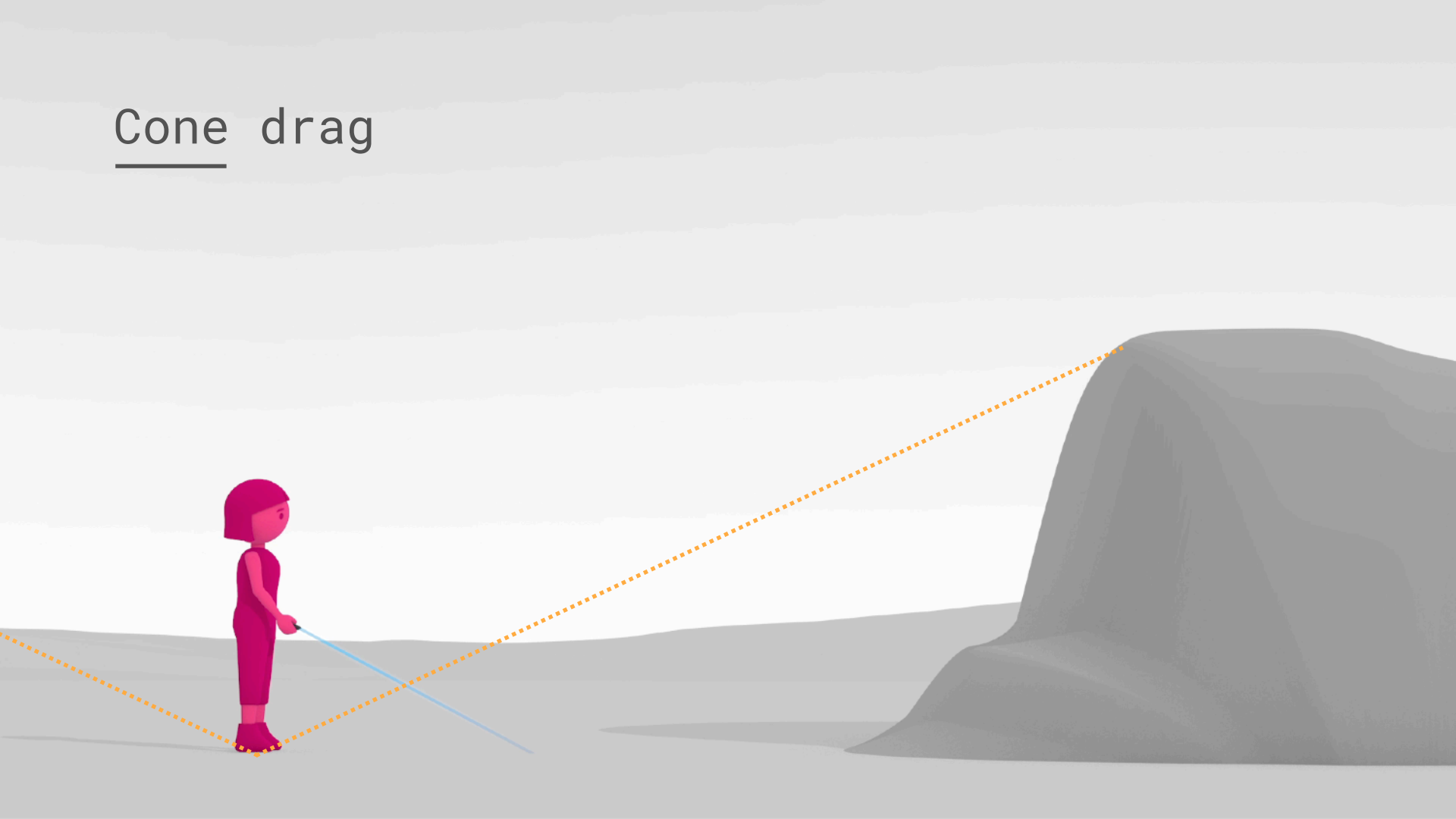
Basic drag



Basic drag



Cone drag



Menu
Fly

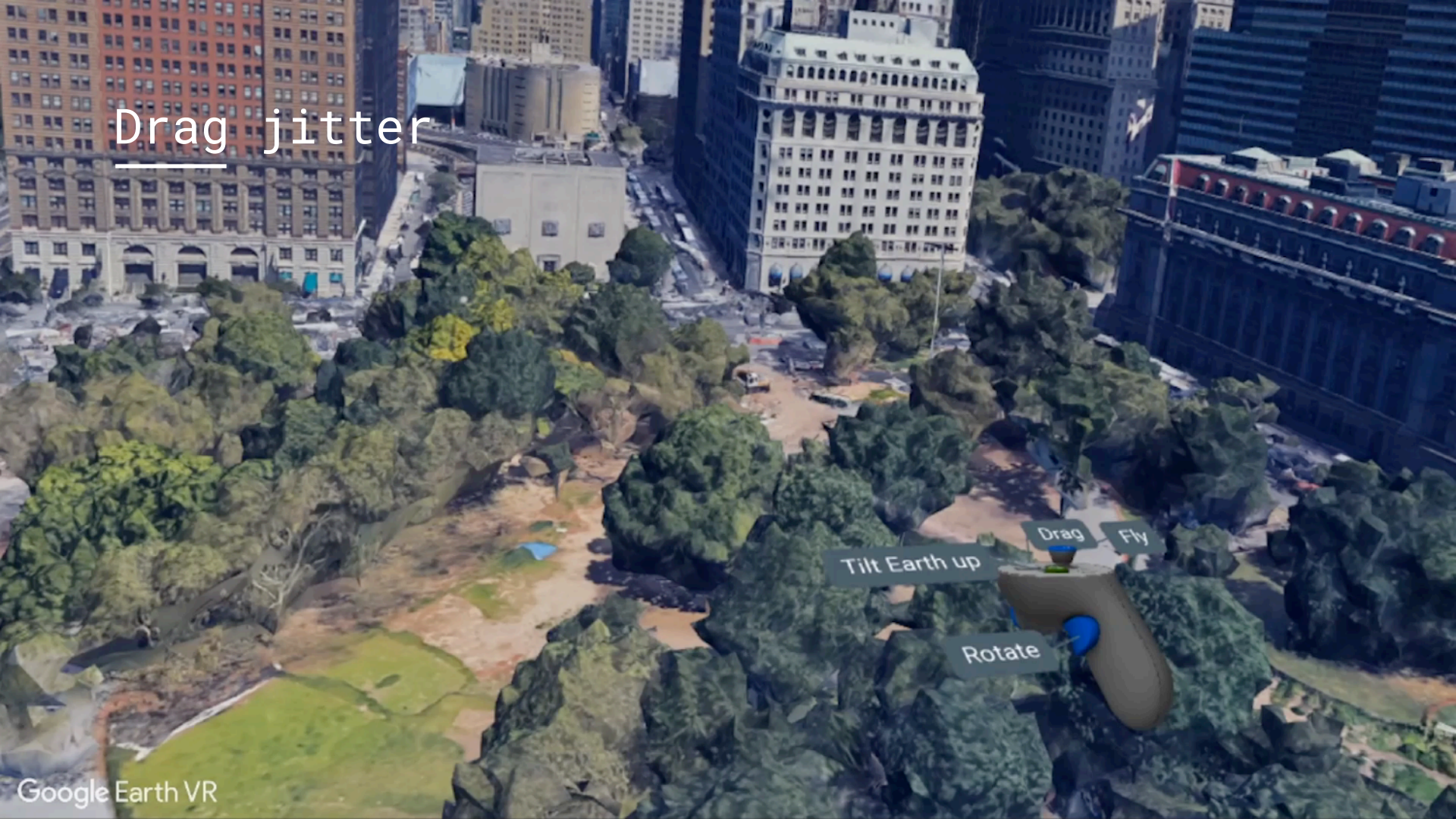
1. Scaled flying
2. Tunnel Vision
3. Cone drag
4. Globe in front

The feel

Per Karlsson
@karlssonper

Drag

Drag jitter

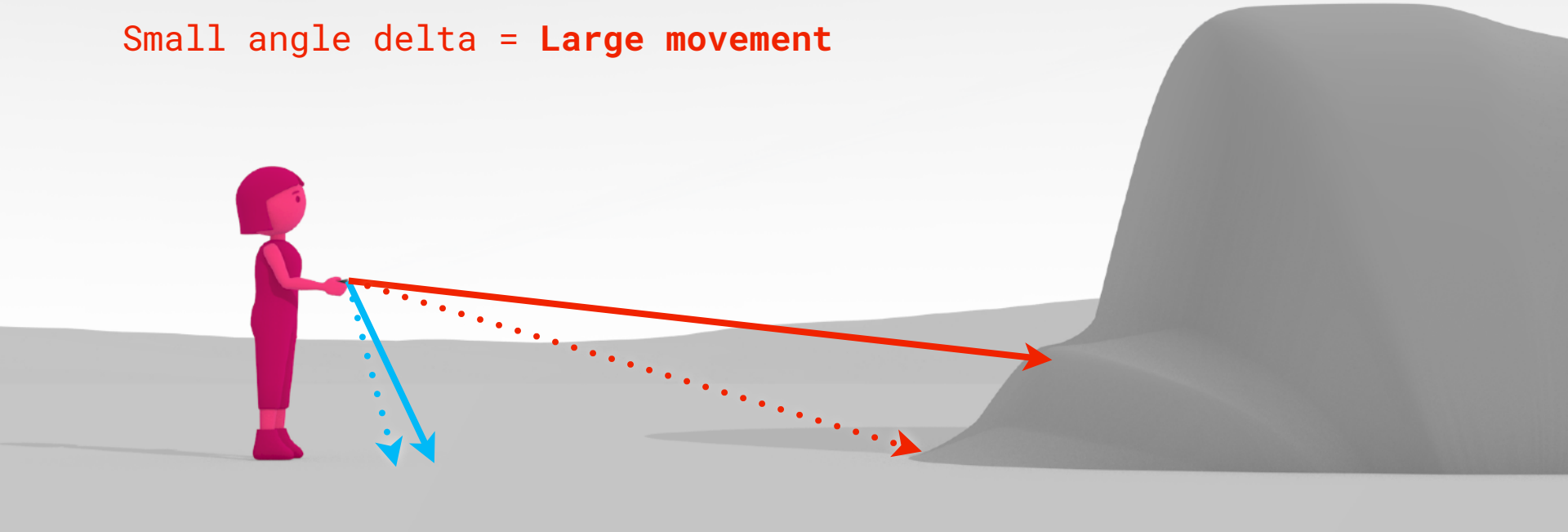


Drag jitter

Distance based smoothing

Small angle delta = **Little movement**

Small angle delta = **Large movement**

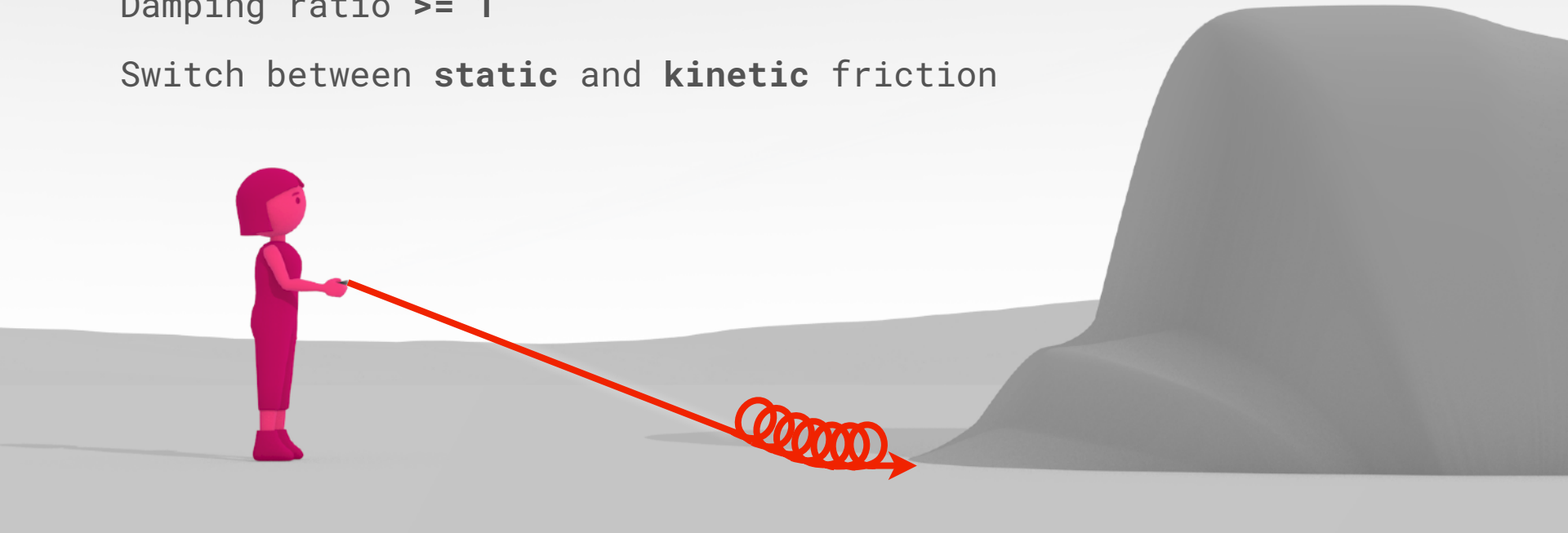


Spring based model

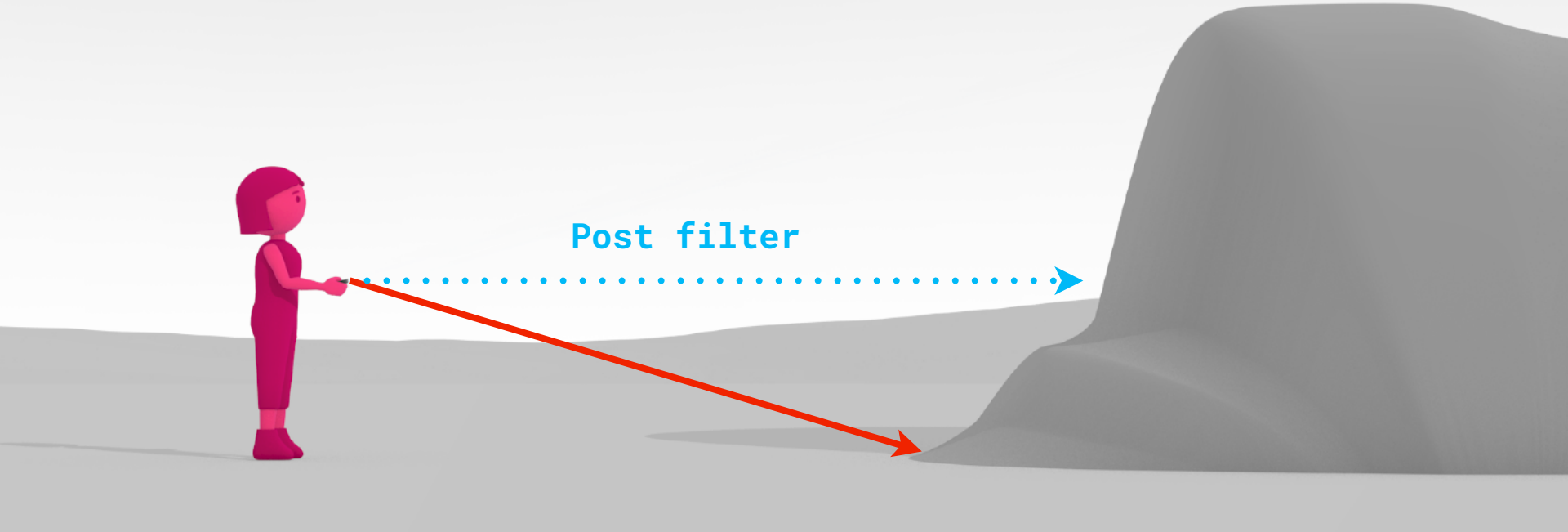
F = kx - cv - friction

Damping ratio **>= 1**

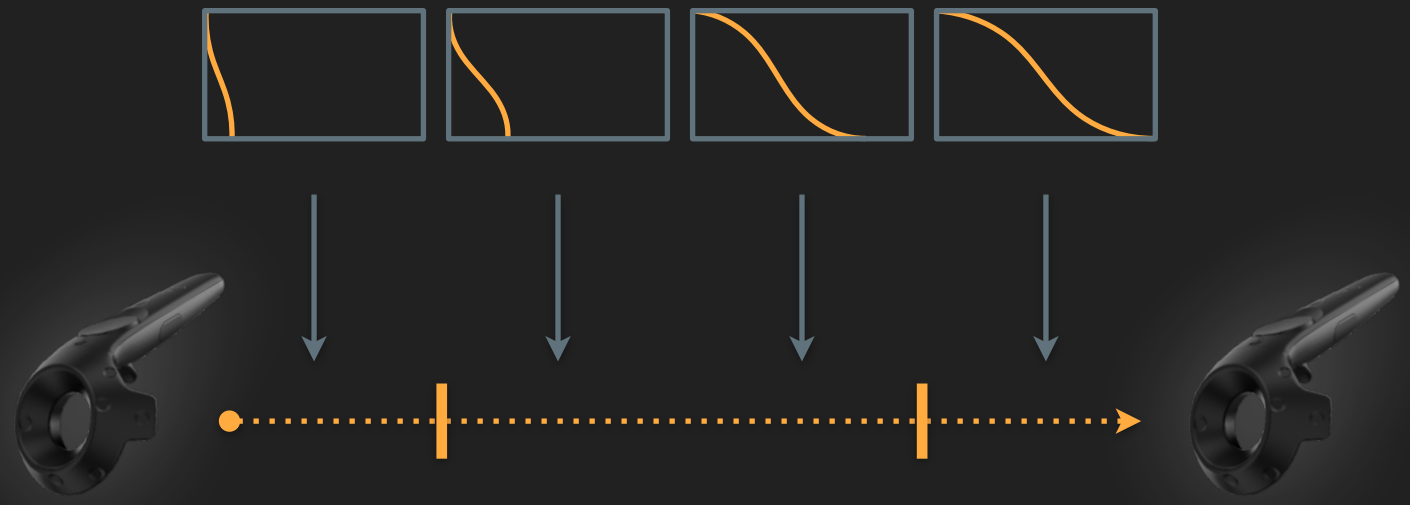
Switch between **static** and **kinetic** friction



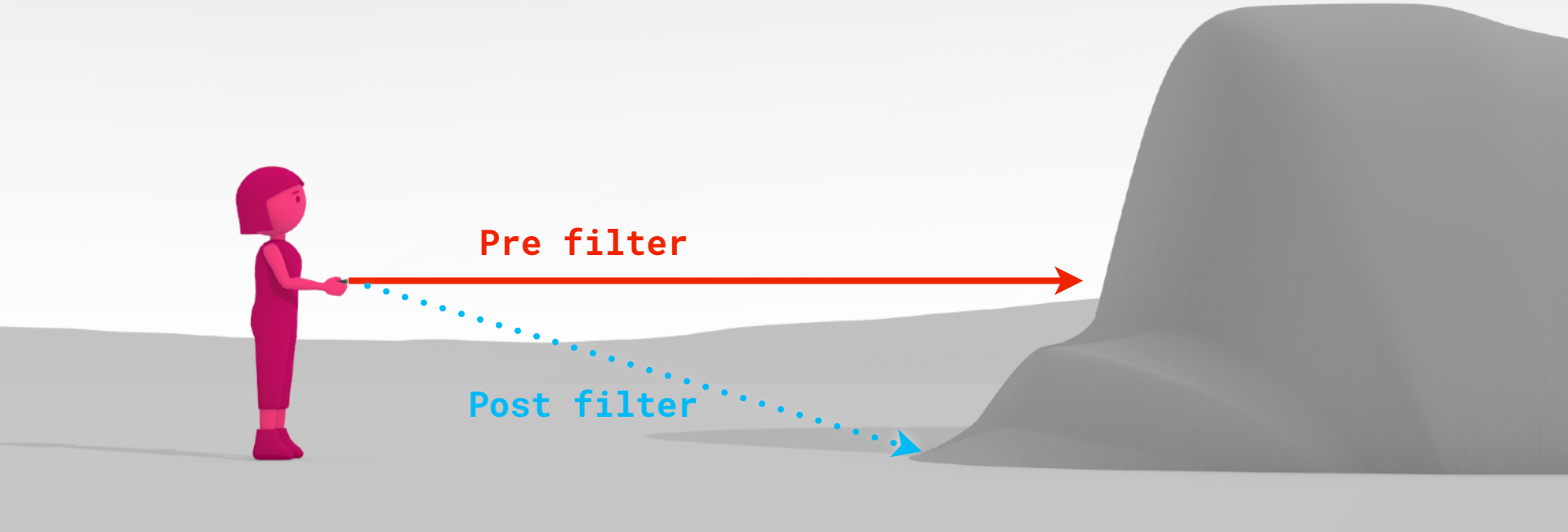
Apply low pass filters



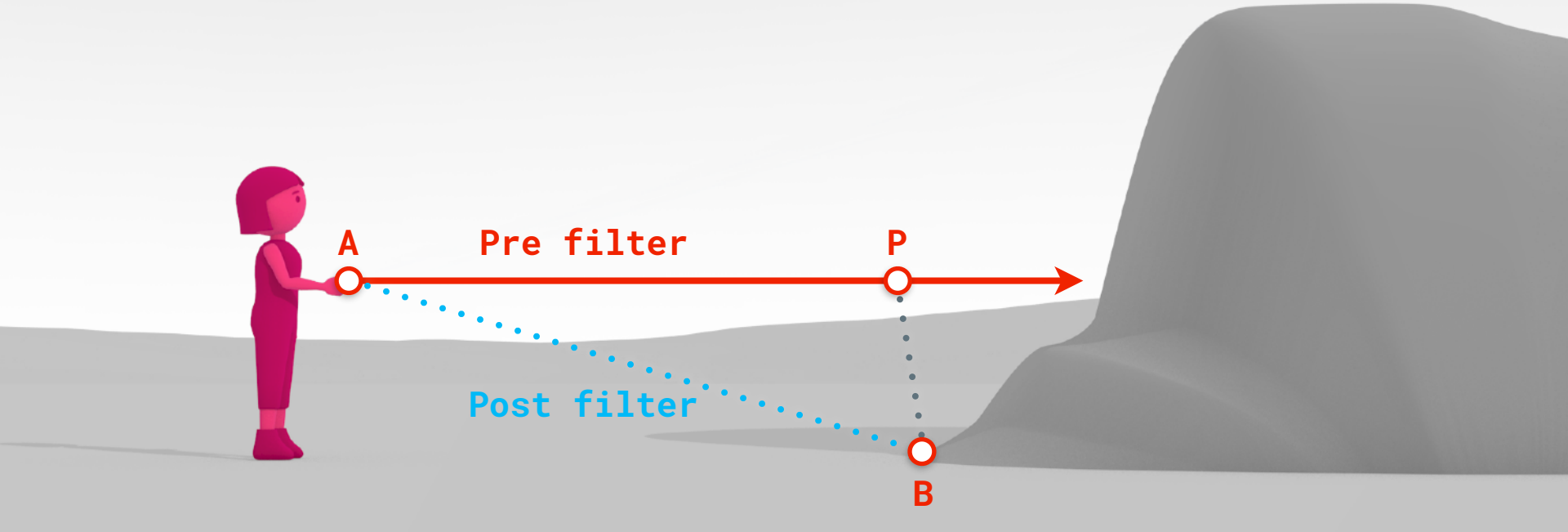
The filters



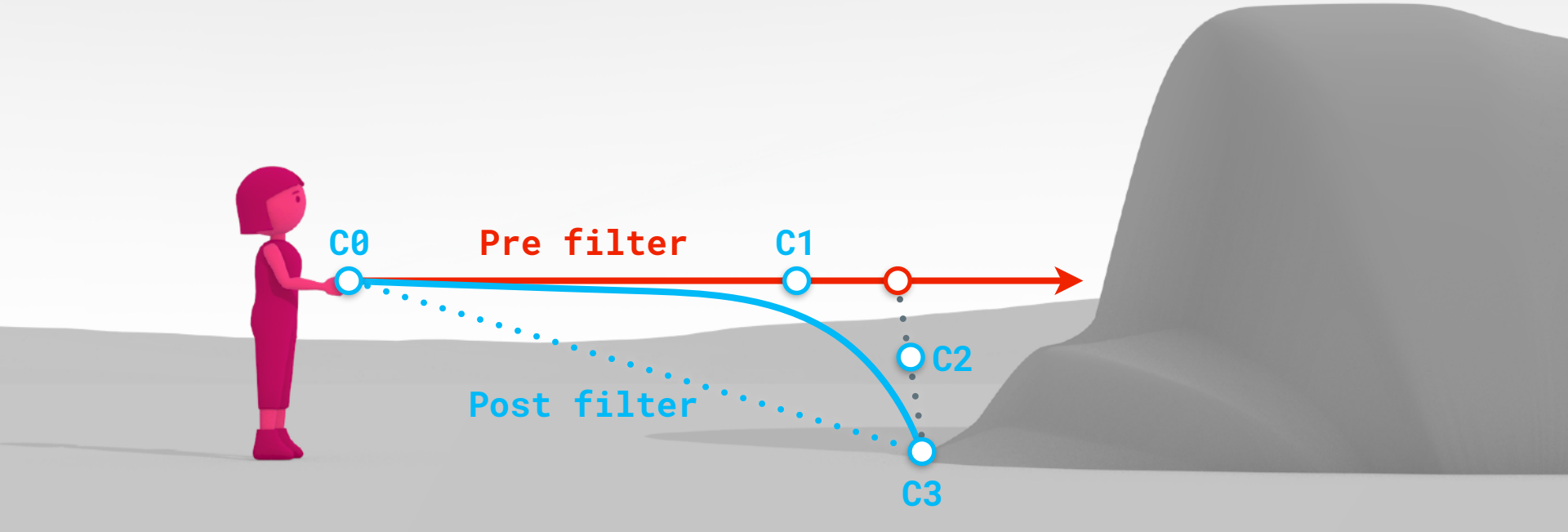
Bendable laser



Bendable laser



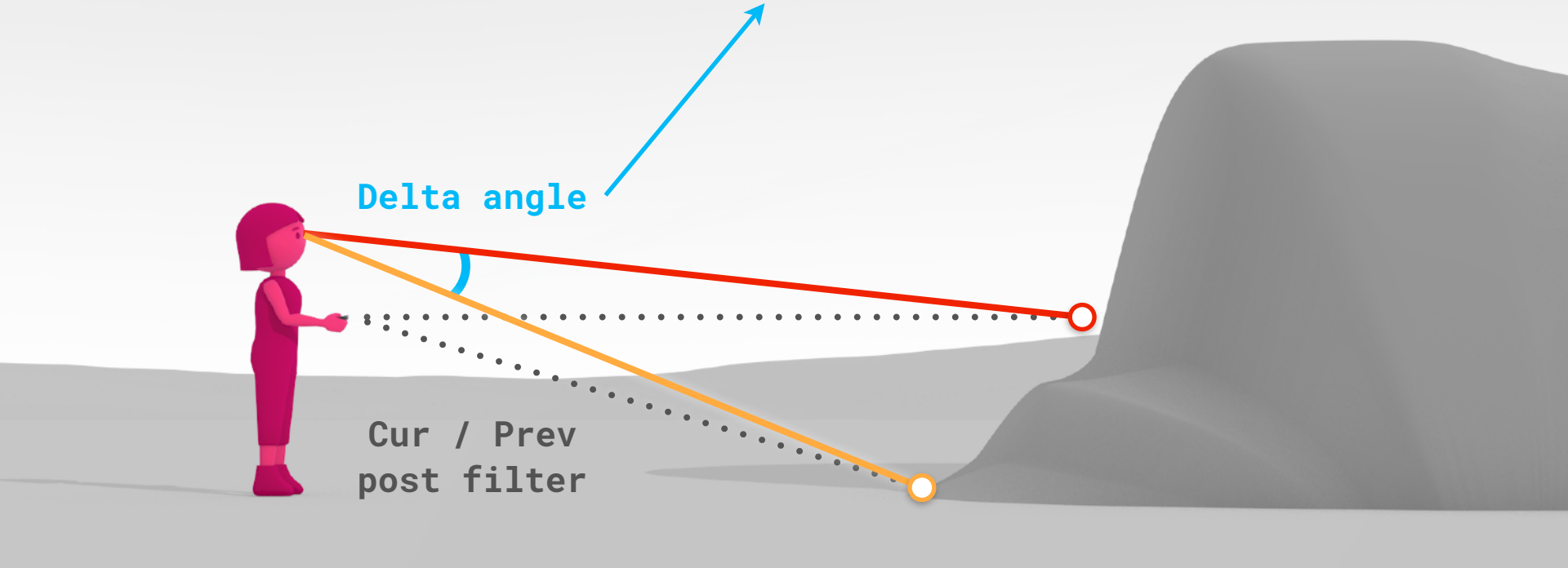
Bendable laser



Drag effects

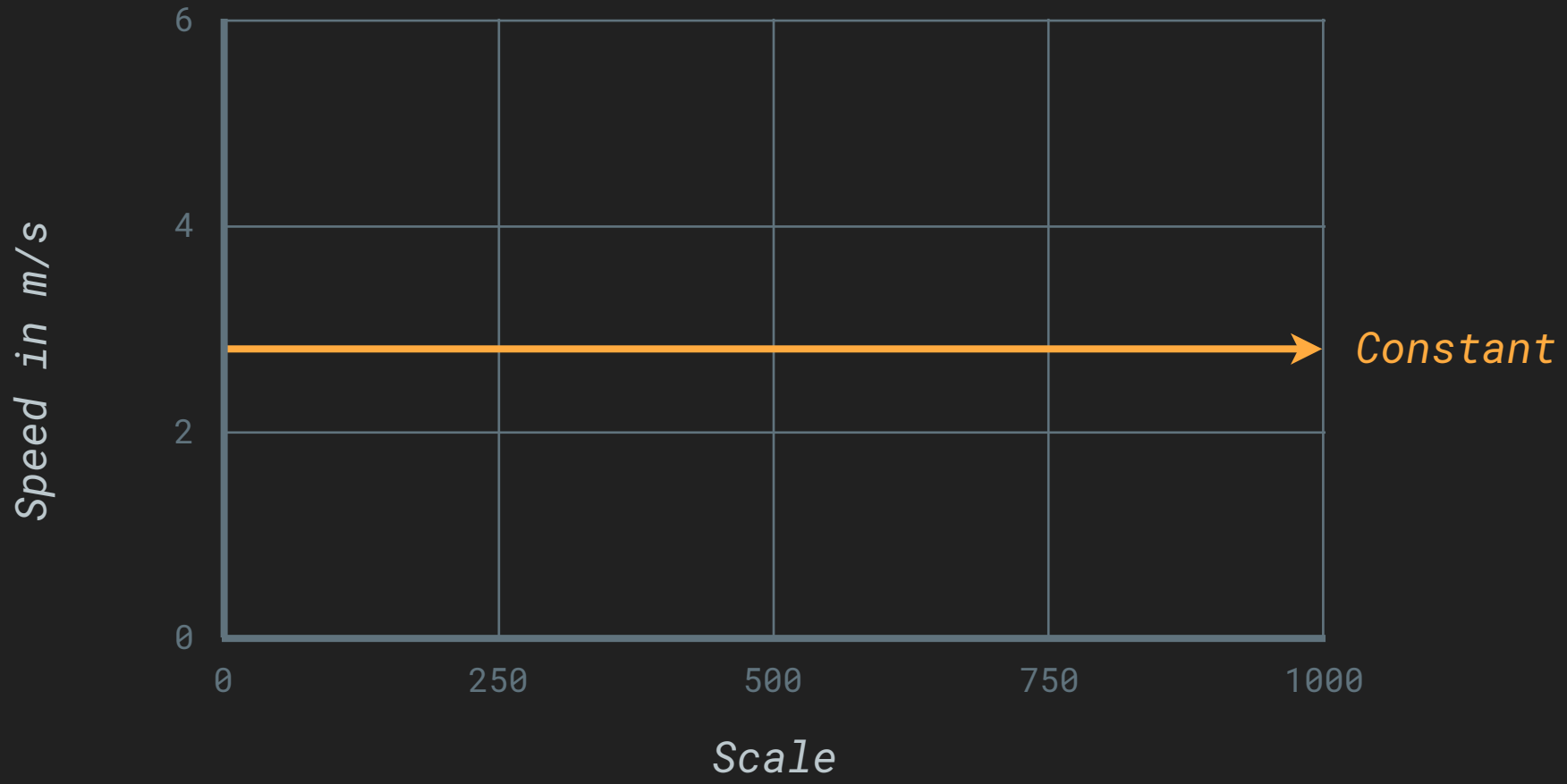
Interpolate between slow / fast sound

Haptics Strength

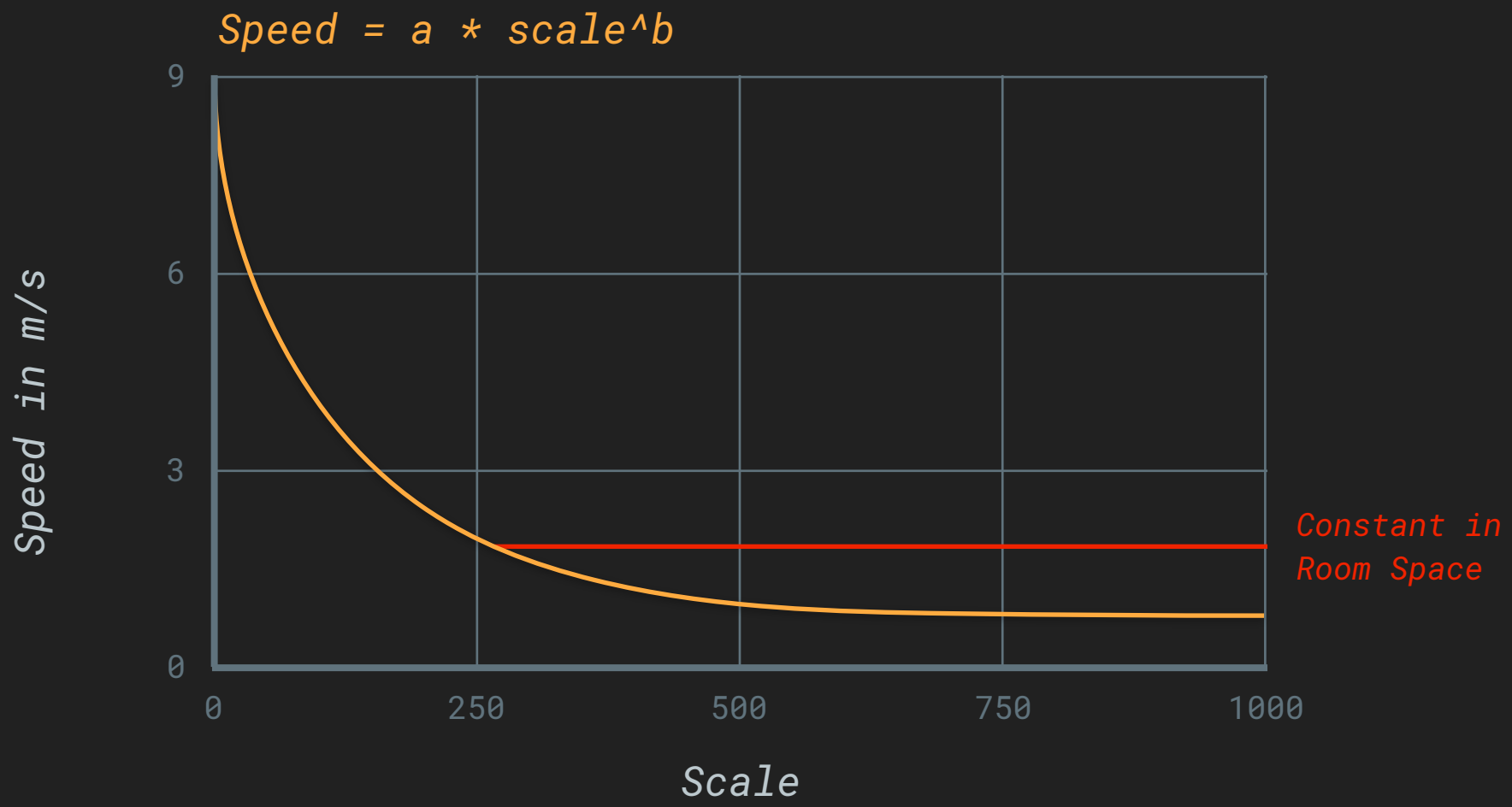


Filtered drag

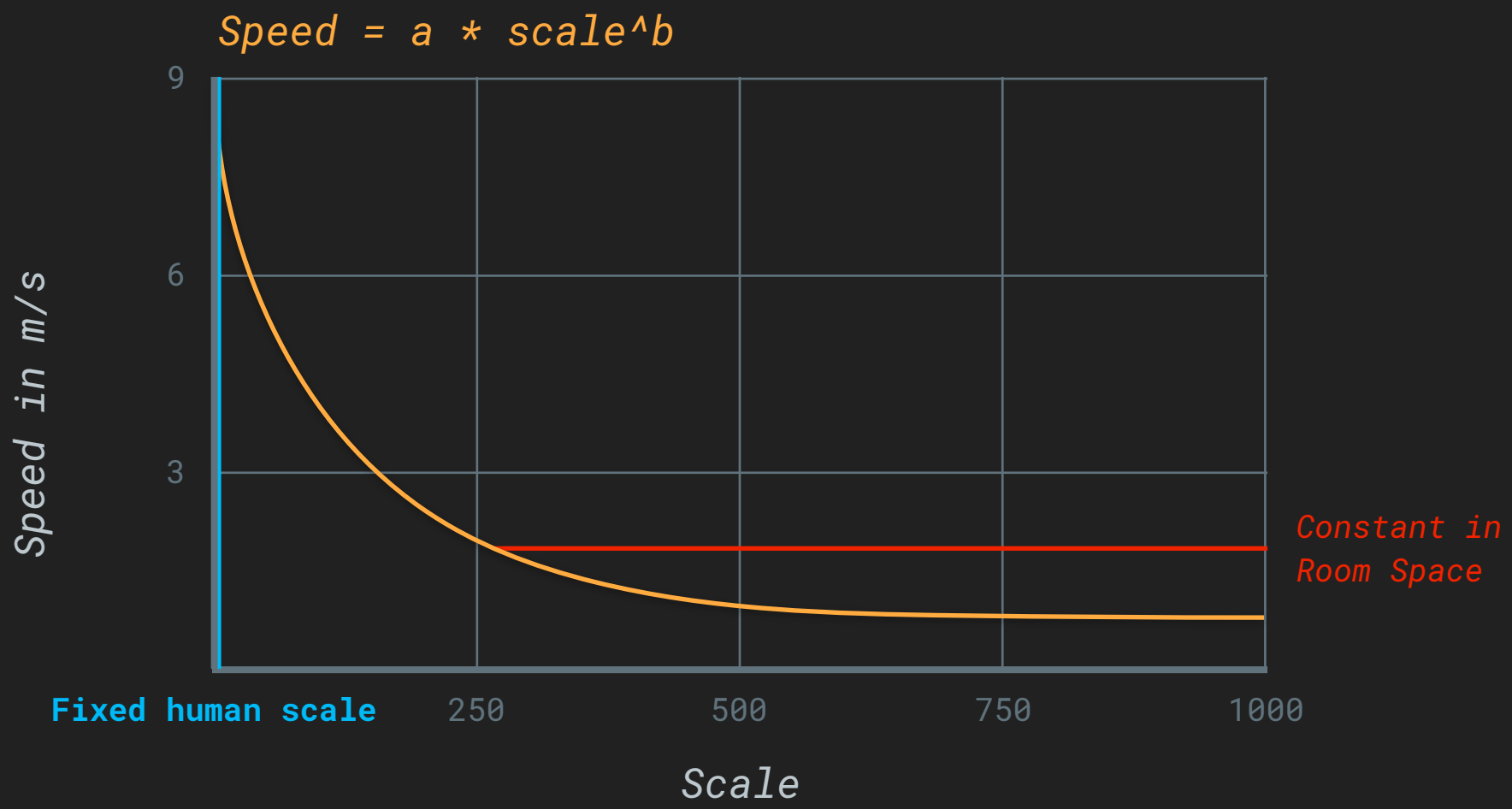
Filtered drag


6
4
2
0
Speed in m/s
Constant
0
250
500
750
1000
Scale

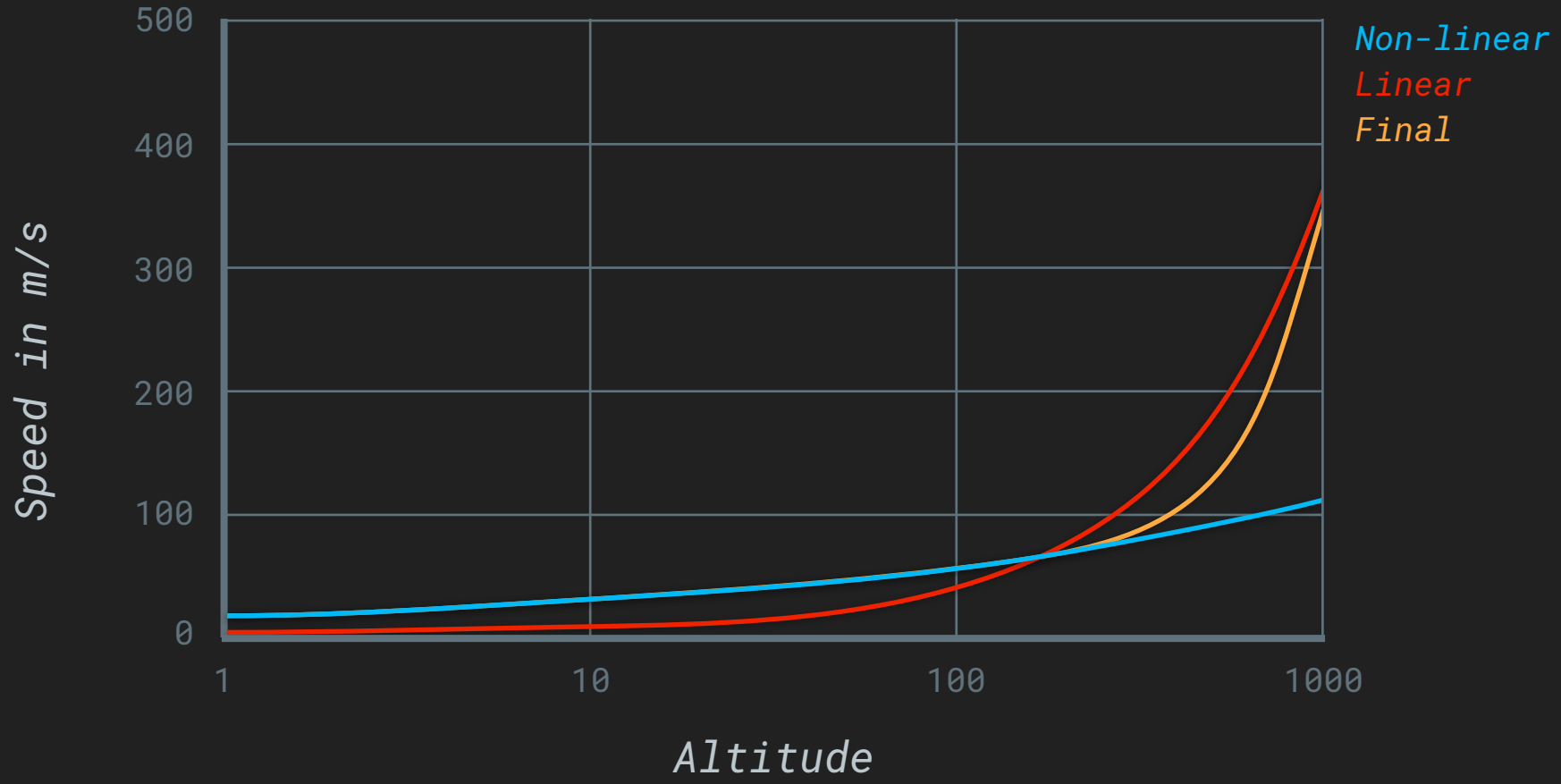
Speed constant in Room Space


Speed = a * scale^b
9
6
3
0
Speed in m/s
0
250
500
750
1000
Scale
Constant in
Room Space

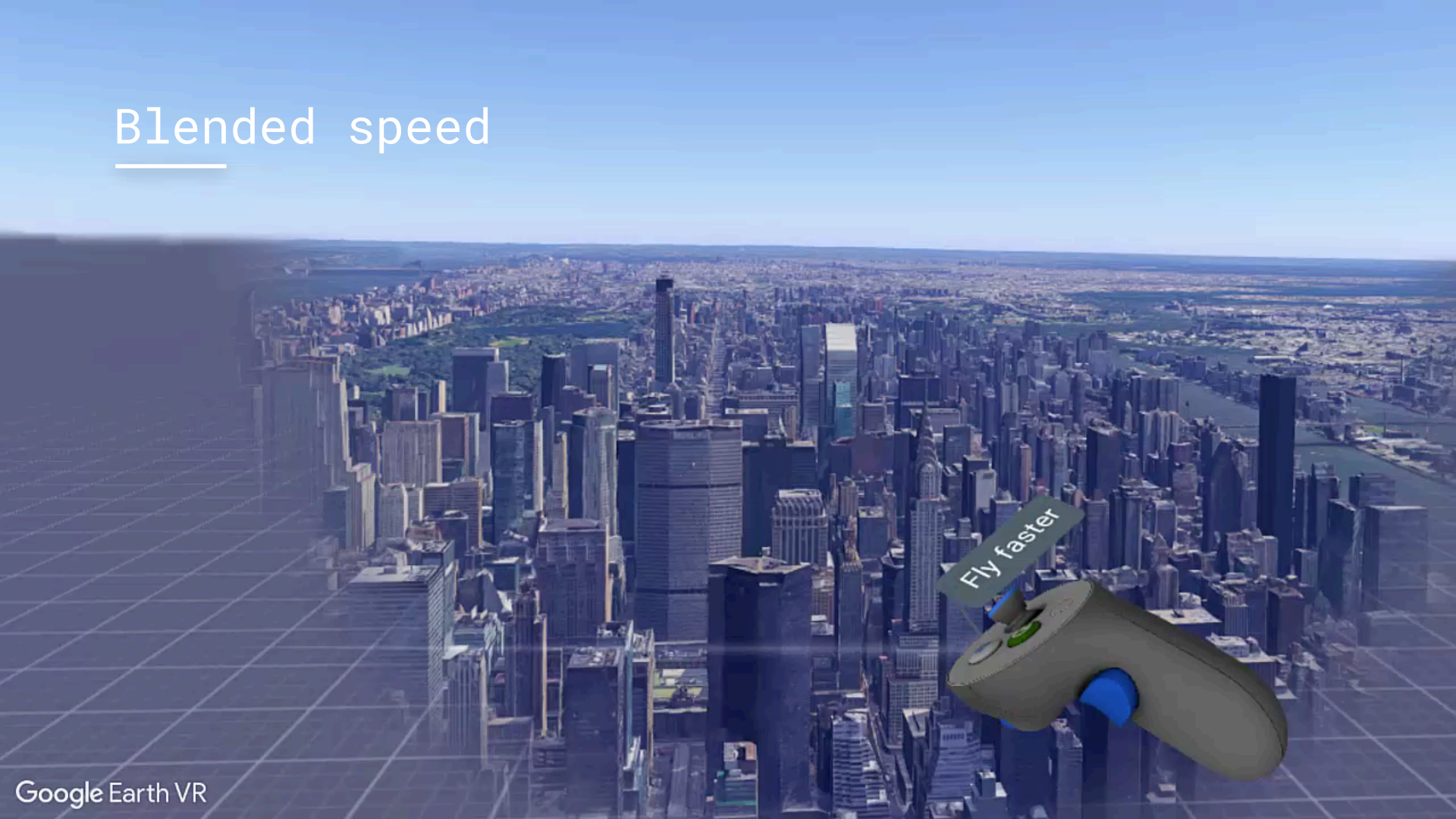
Speed as power function

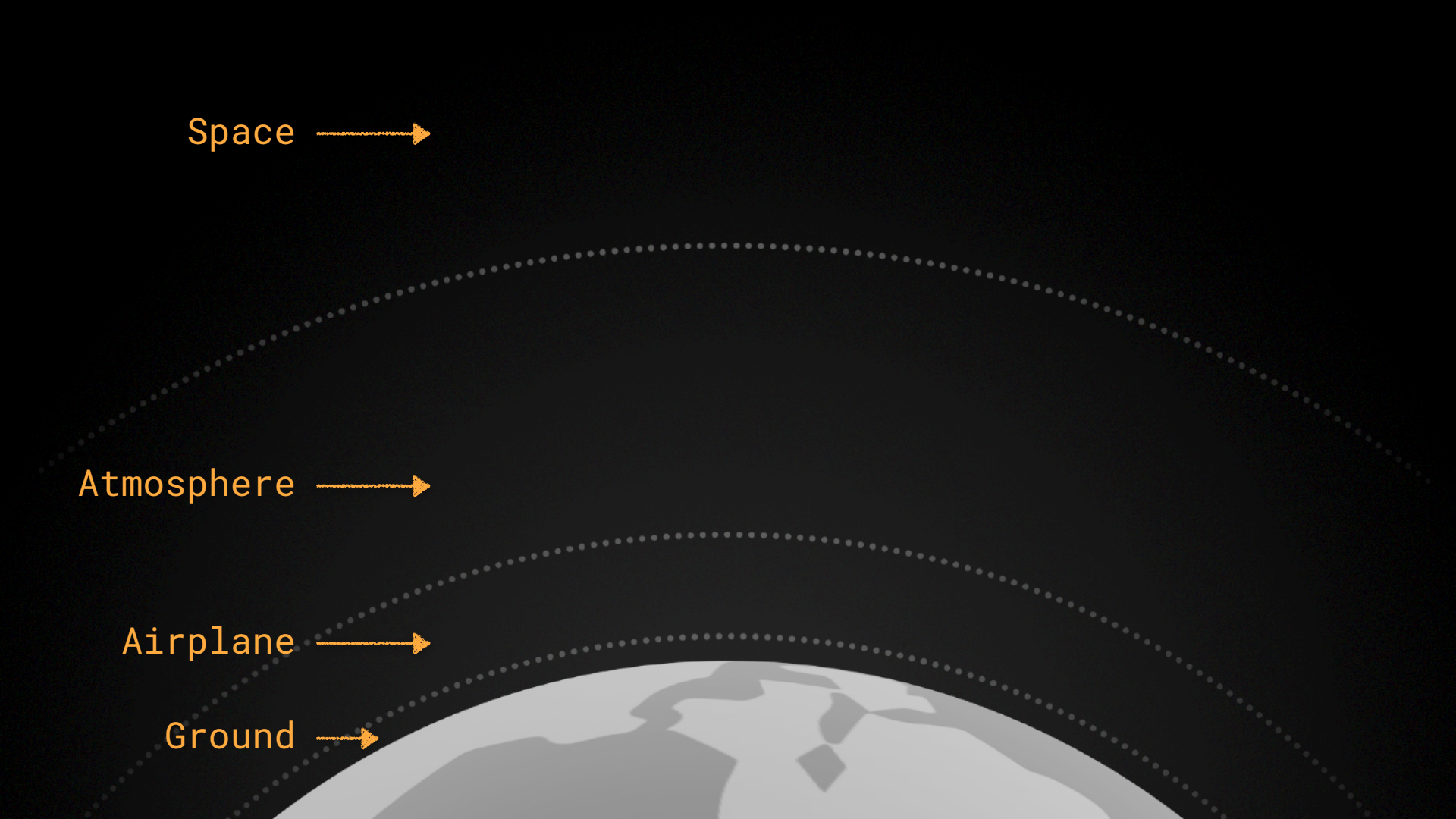

Speed = a * scale^b
9
6
3
Speed in m/s
Constant in Room Space
Fixed human scale
250
500
750
1000
Scale

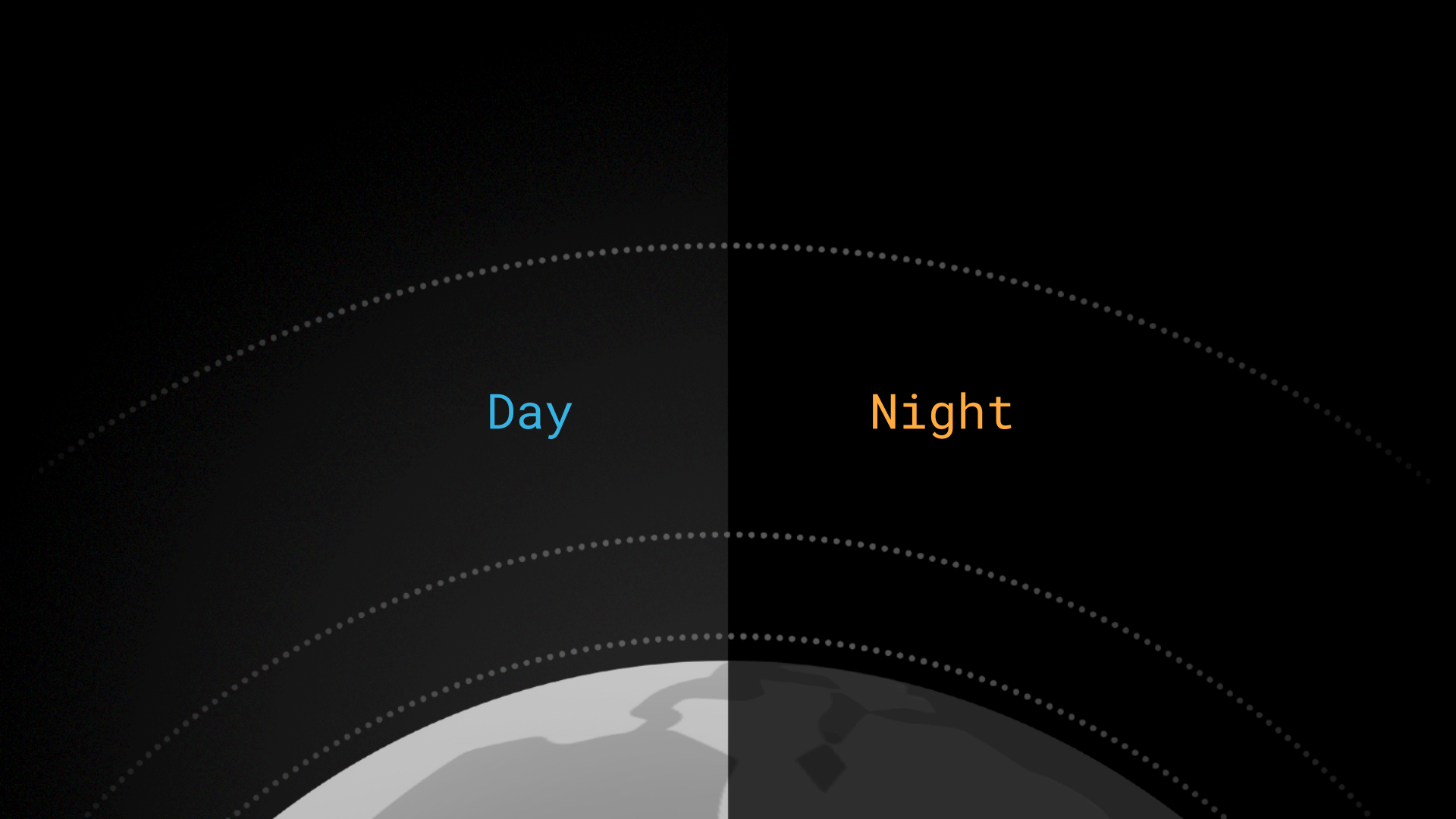
Constant speed


Non-linear
Linear
Final
500
400
300
200
100
0
Speed in m/s
1
10
100
1000
Altitude

Blended speed




Space
Atmosphere
Airplane
Ground

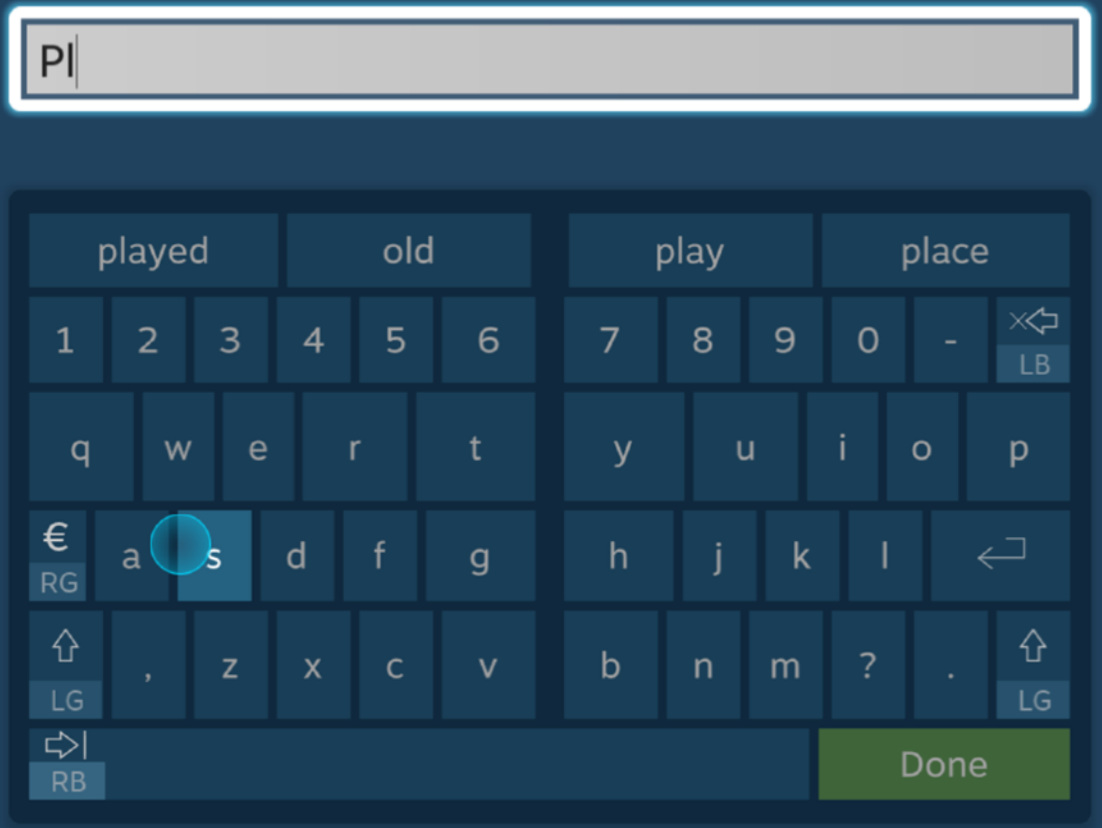

Day
Night

1. Simulating weight
2. Adaptive flight speed
3. Dynamic soundscapes

Search

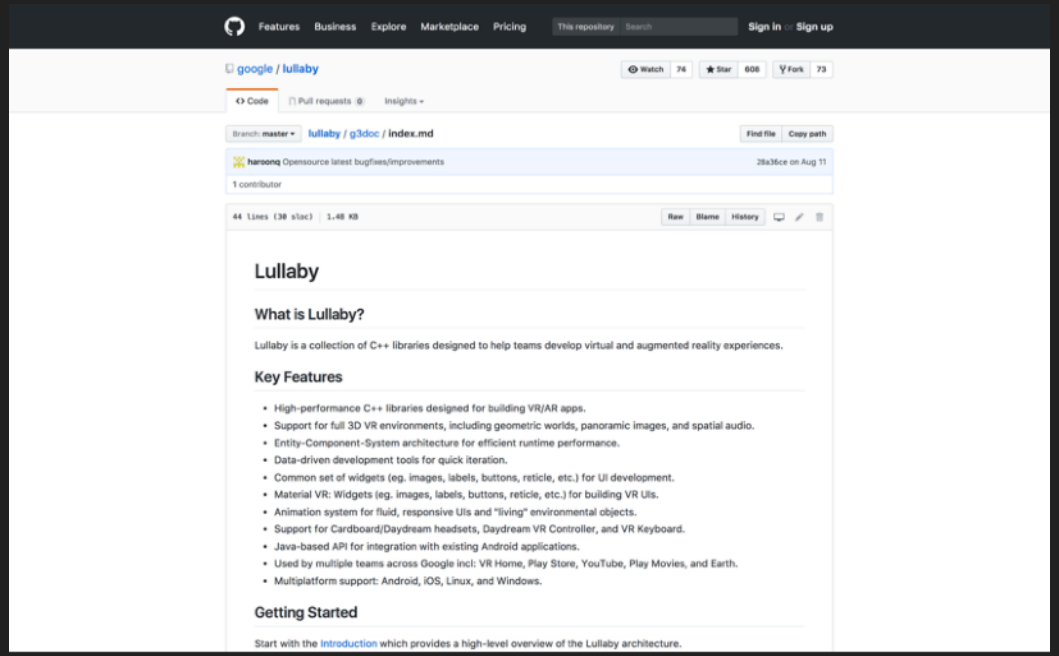
Nadav Ashkenazi
@nadavash

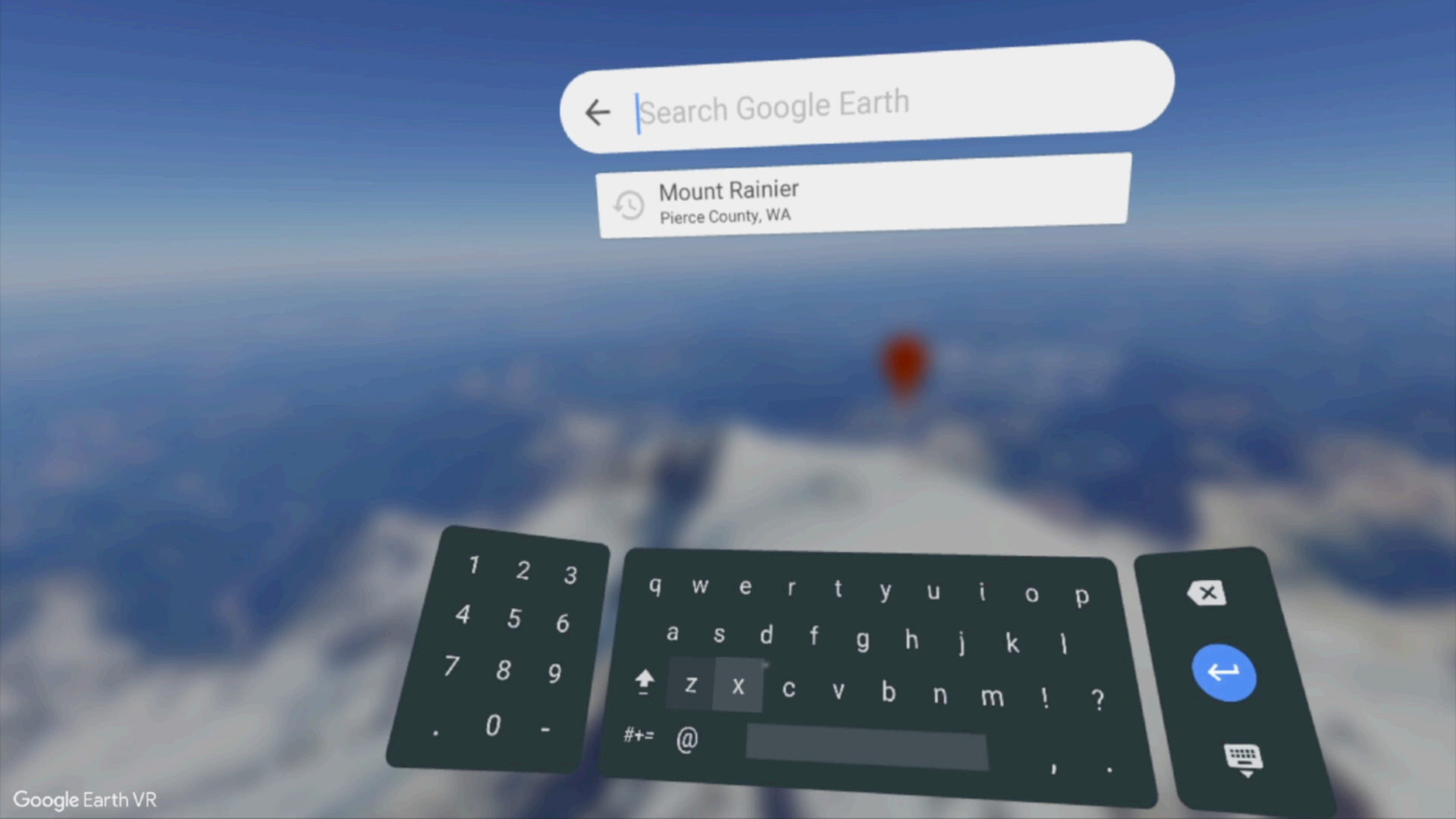
1. Input UI
2. Search destination
3. Search pin


Pl
played
old
play
place
1 2 3 4 5 6 7 8 9 0 -
LB
q w e r t y u i o p
€
RG
a s d f g h j k l
LG
, z x c v b n m ? .
LG
RB
Done

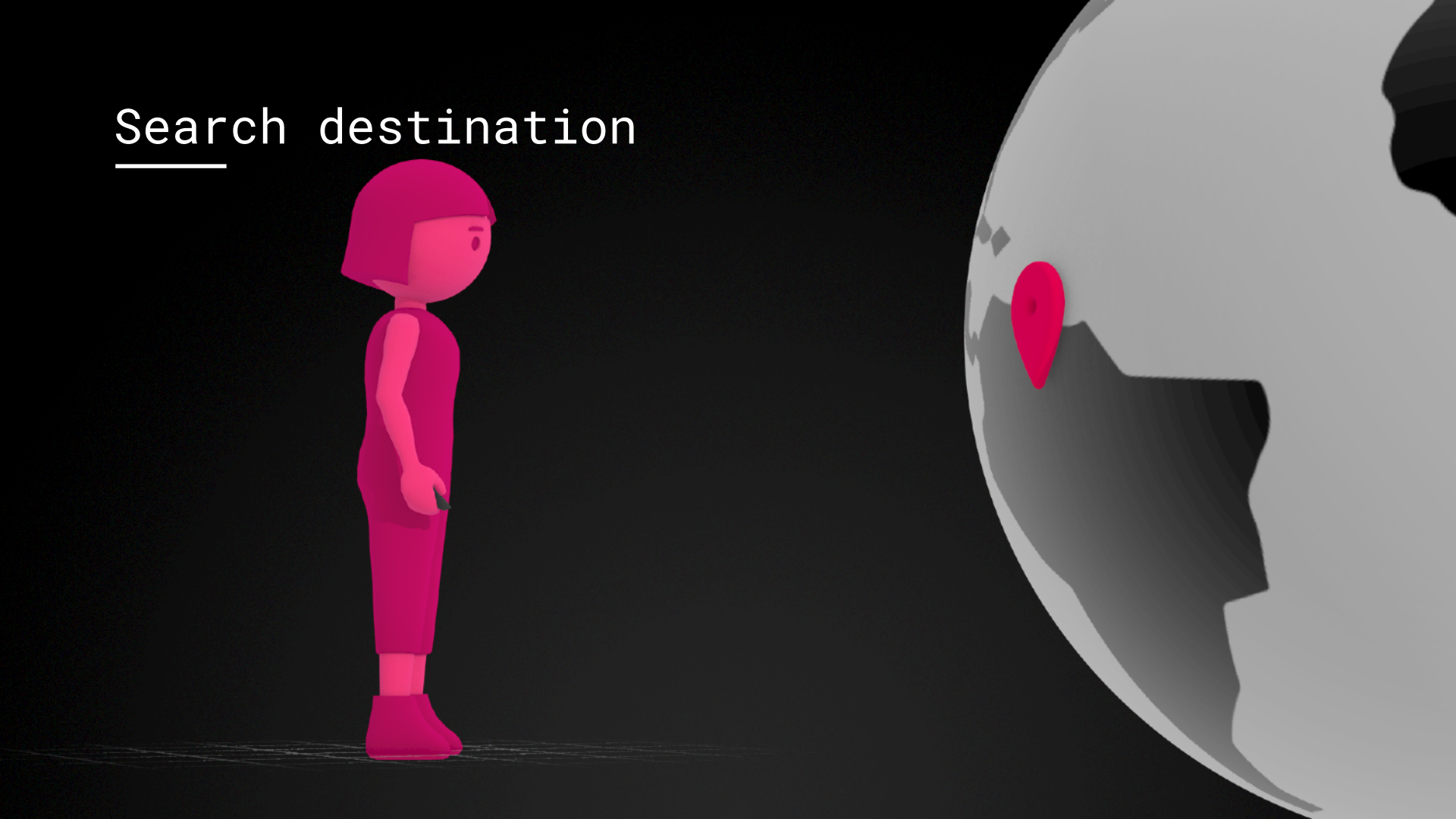
Lullaby

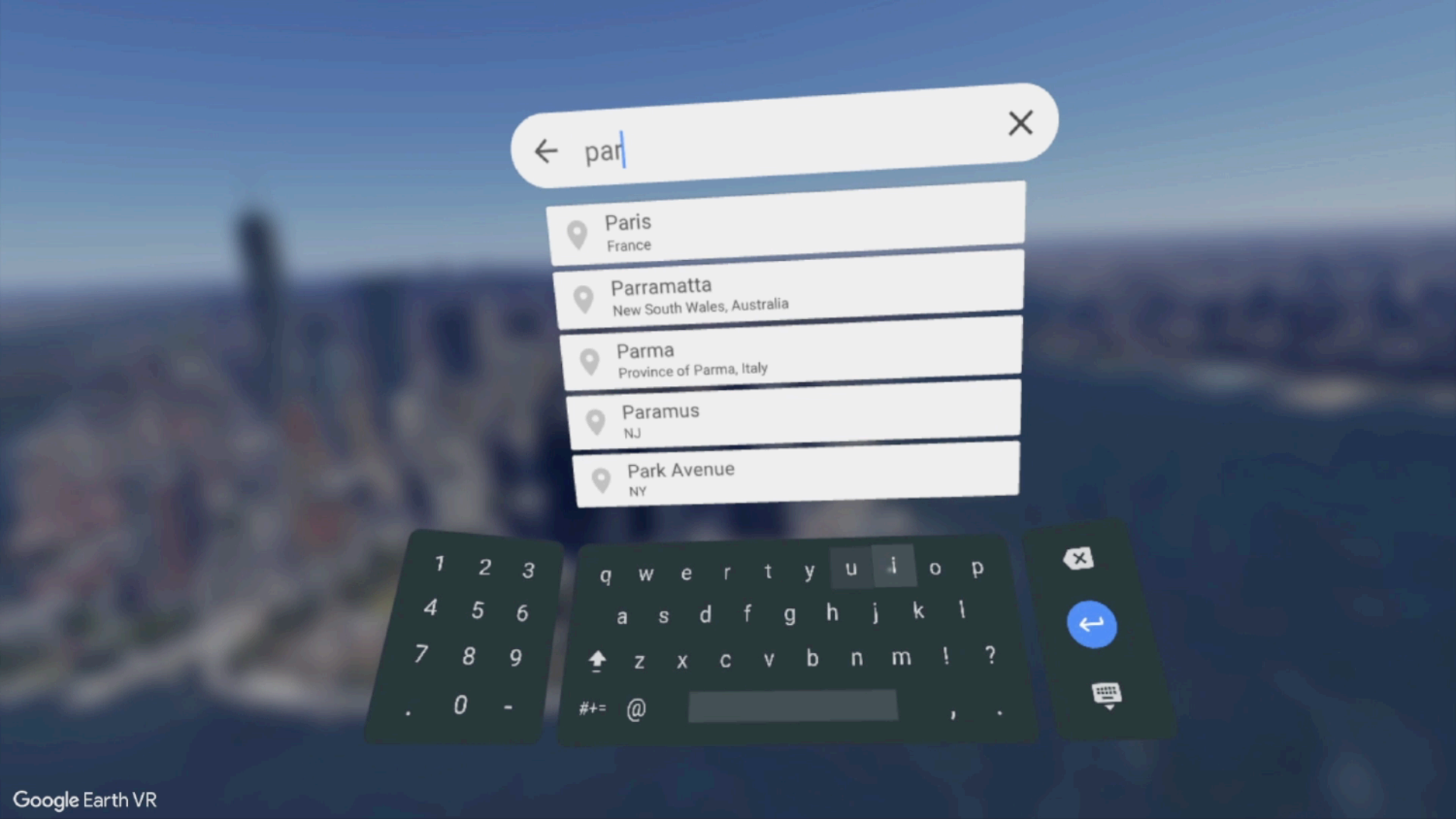
github.com/google/lullaby



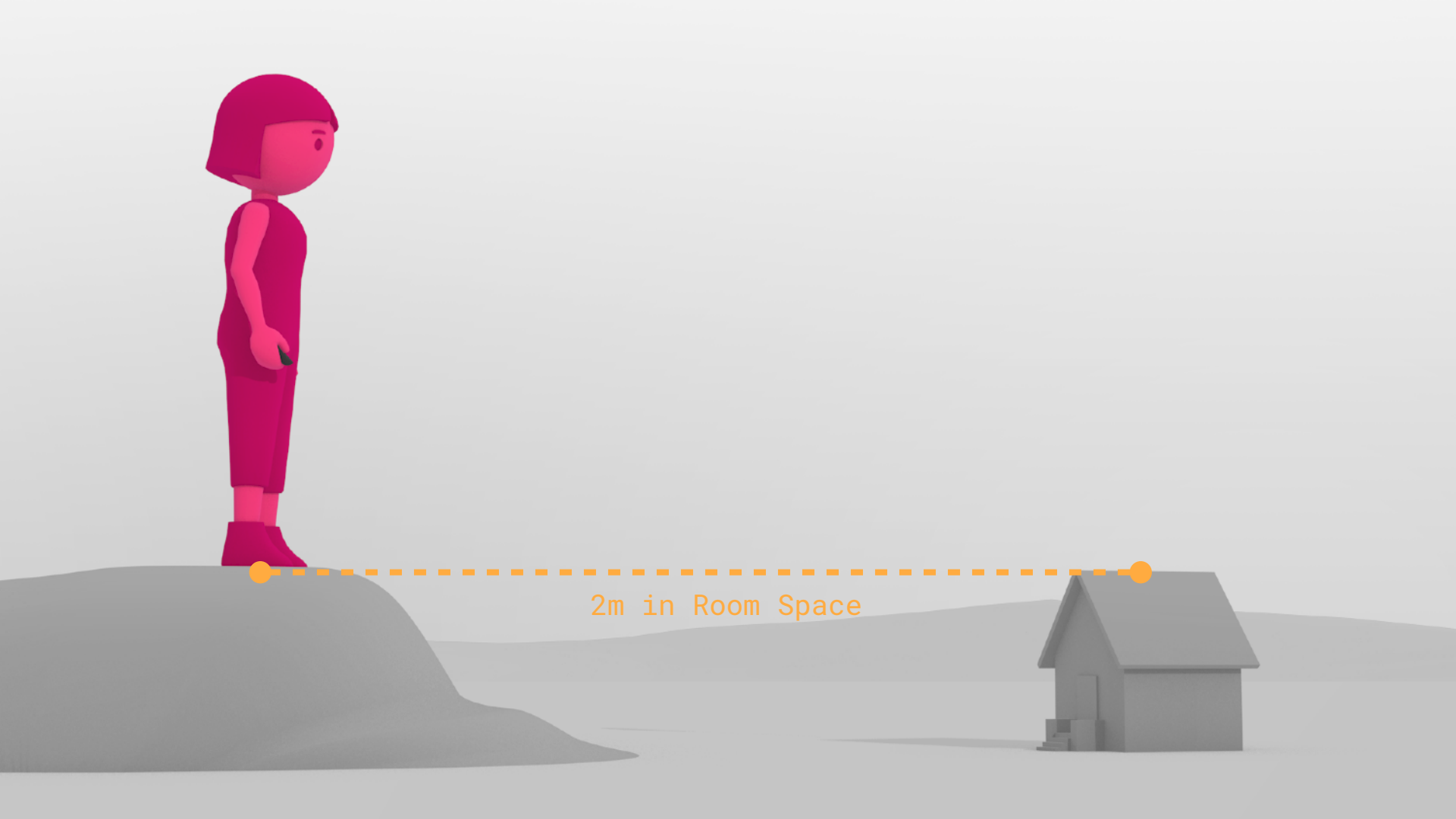

Search Google Earth
Mount Rainier
Pierce County, WA
1 2 3
4 5 6
7 8 9
. 0 -
q w e r t y u i o p
a s d f g h j k l
z x c v b n m ! ?
#+= @
, .
Google Earth VR

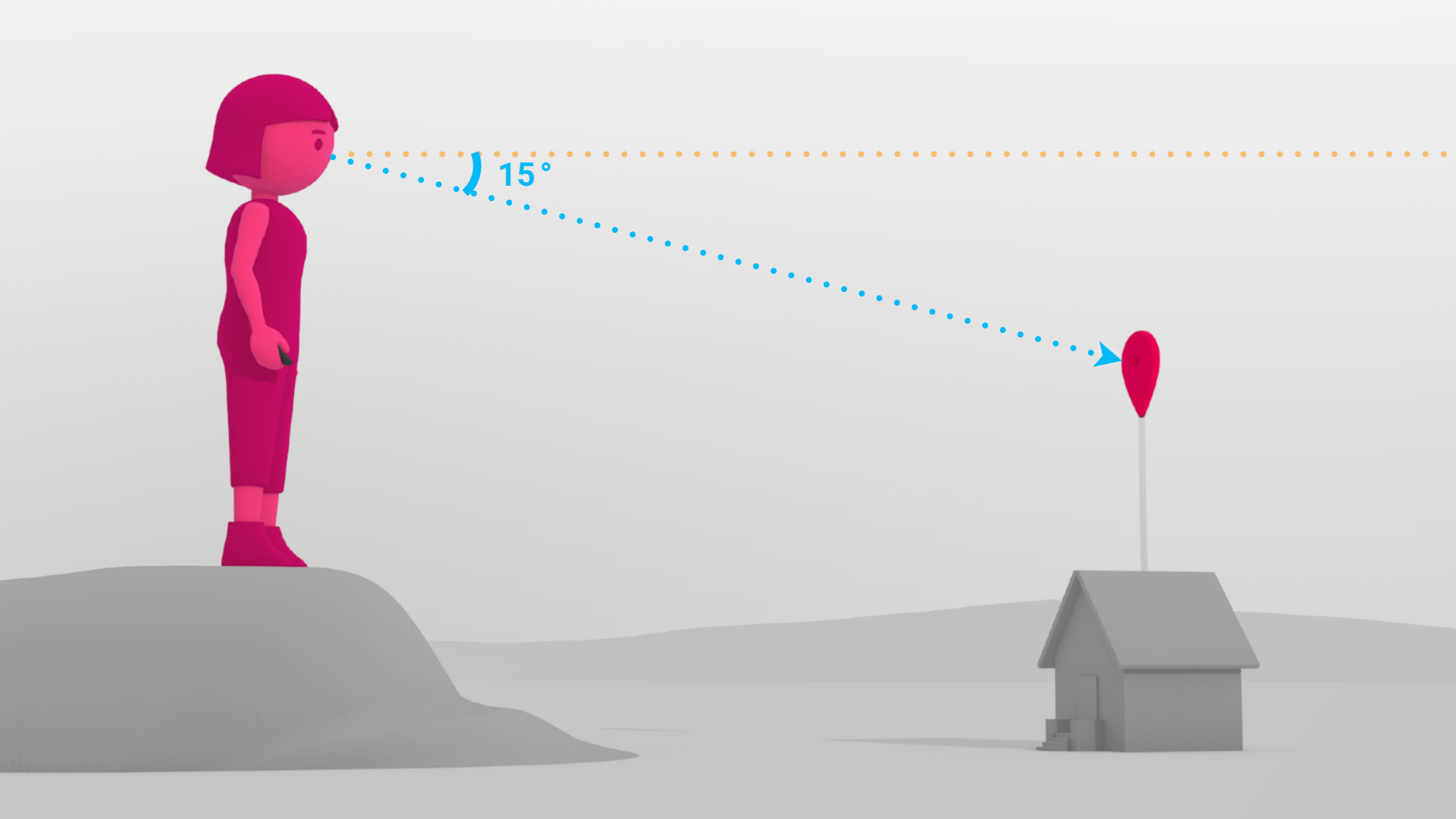
Search destination




par
Paris
France
Parramatta
New South Wales, Australia
Parma
Province of Parma, Italy
Paramus
NJ
Park Avenue
NY
1 2 3
4 5 6
7 8 9
. 0 -
q w e r t y u i o p
a s d f g h j k l
z x c v b n m ! ?
#+= @
, .
Google Earth VR

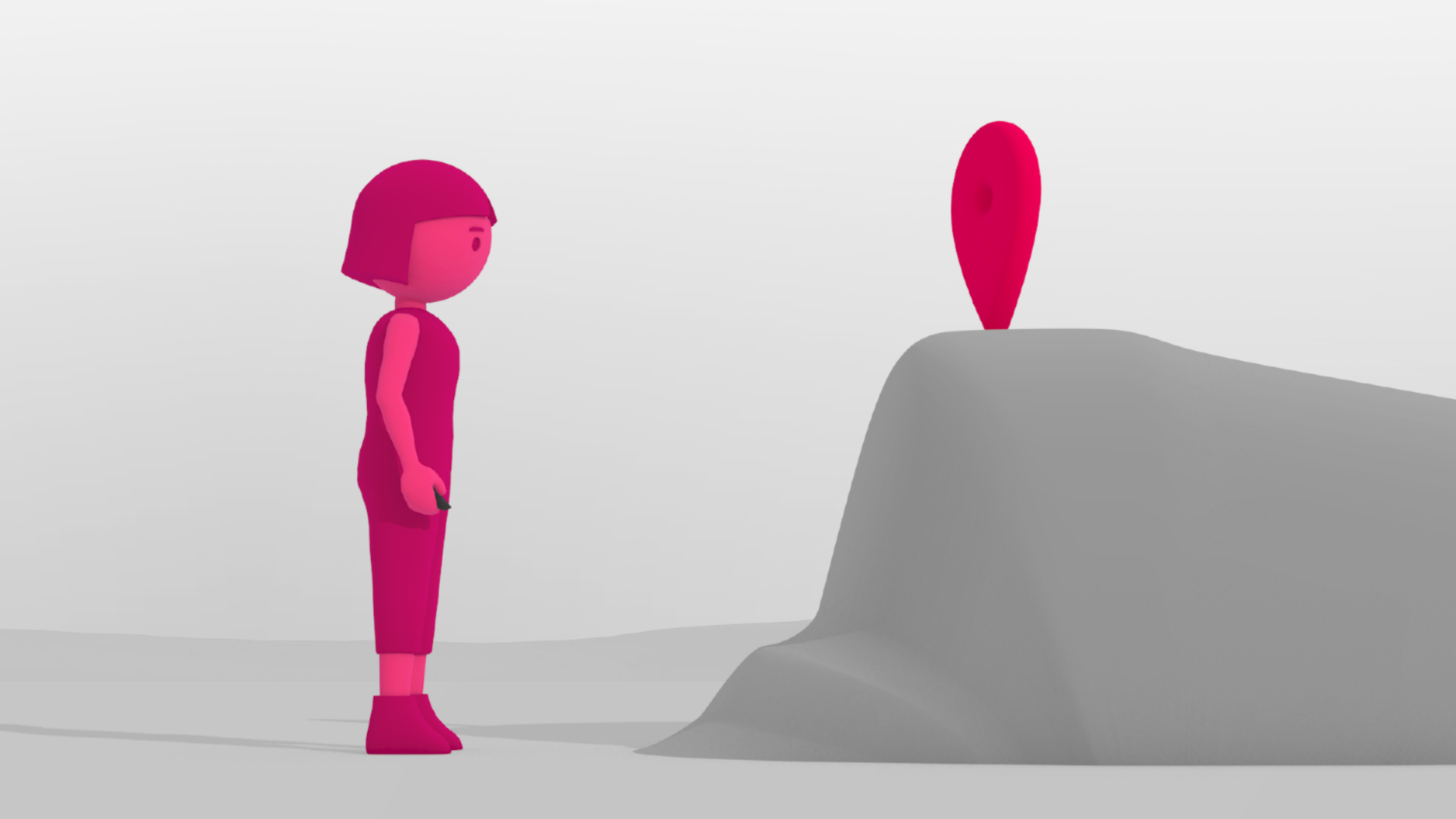
half
Half Moon Bay
CA
Half Moon Bay State Beach
Half Moon Bay, CA
Halfweg
Netherlands
Halford Avenue
Santa Clara, CA
Half Moon Bay
Auckland, New Zealand
1 2 3
4 5 6
7 8 9
. 0 -
q w e r t y u i o p
a s d f g h j k l
z x c v b n m ! ?
#+= @
, .
Google Earth VR

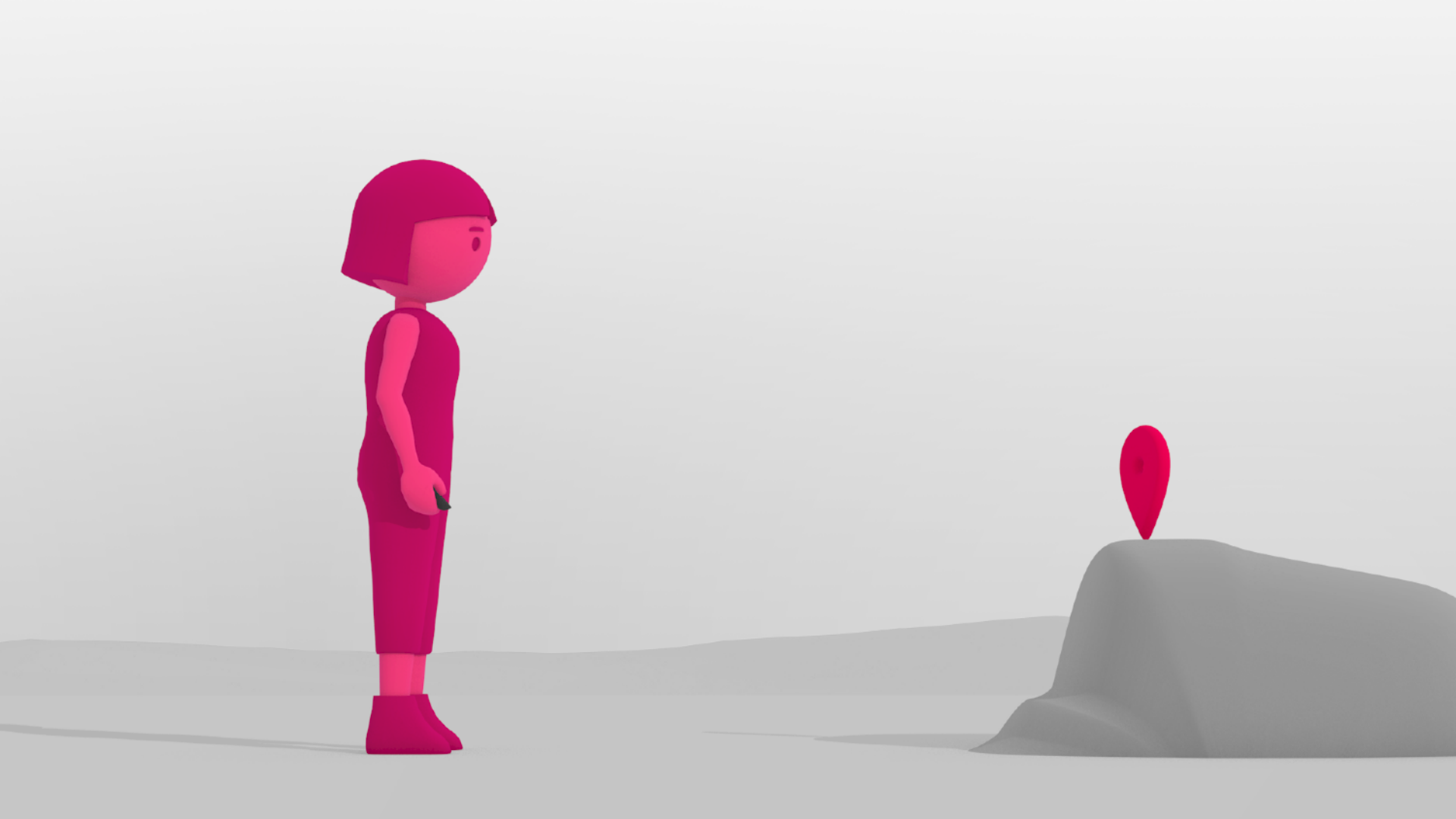

2m in Room Space

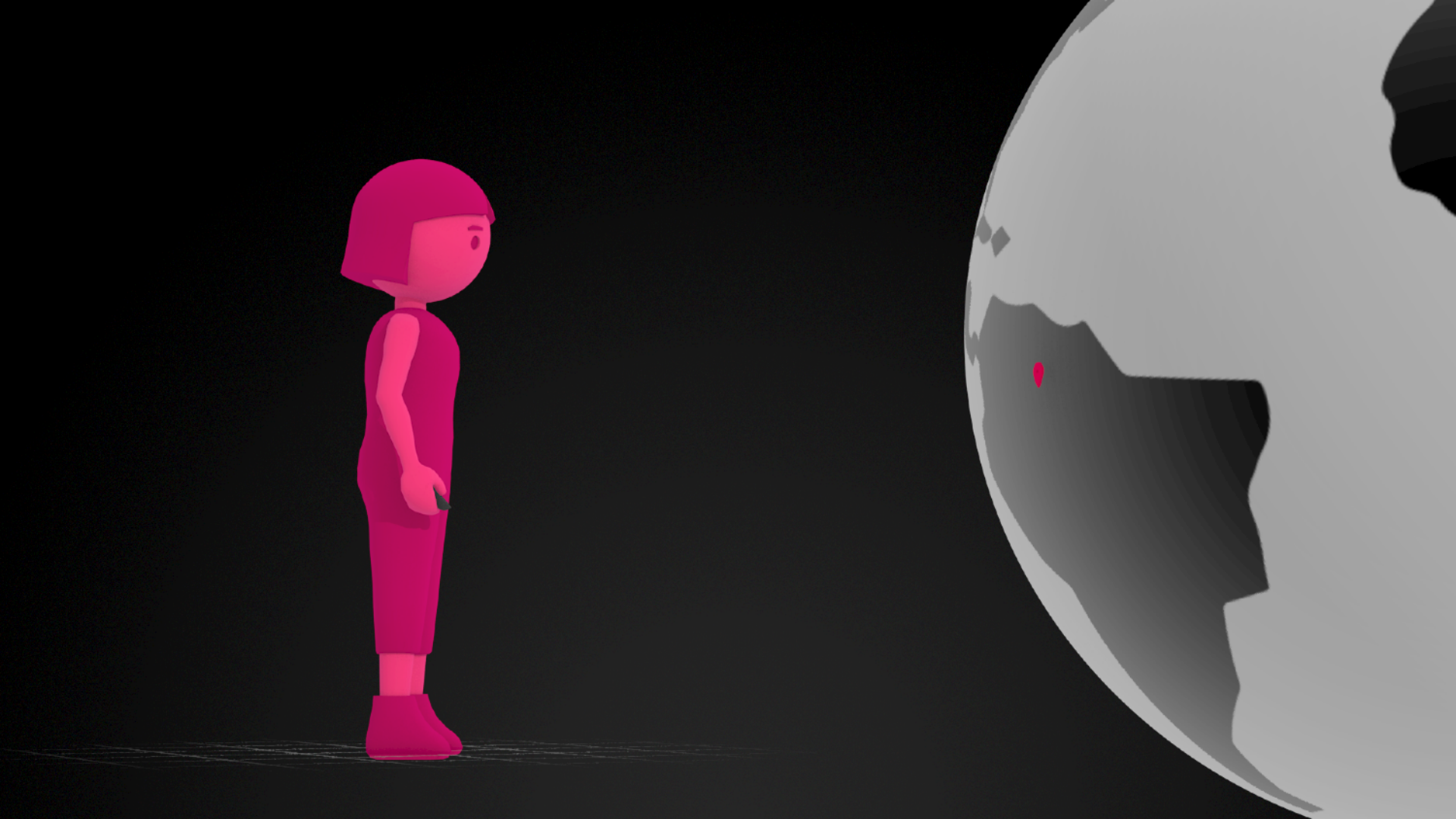

15°

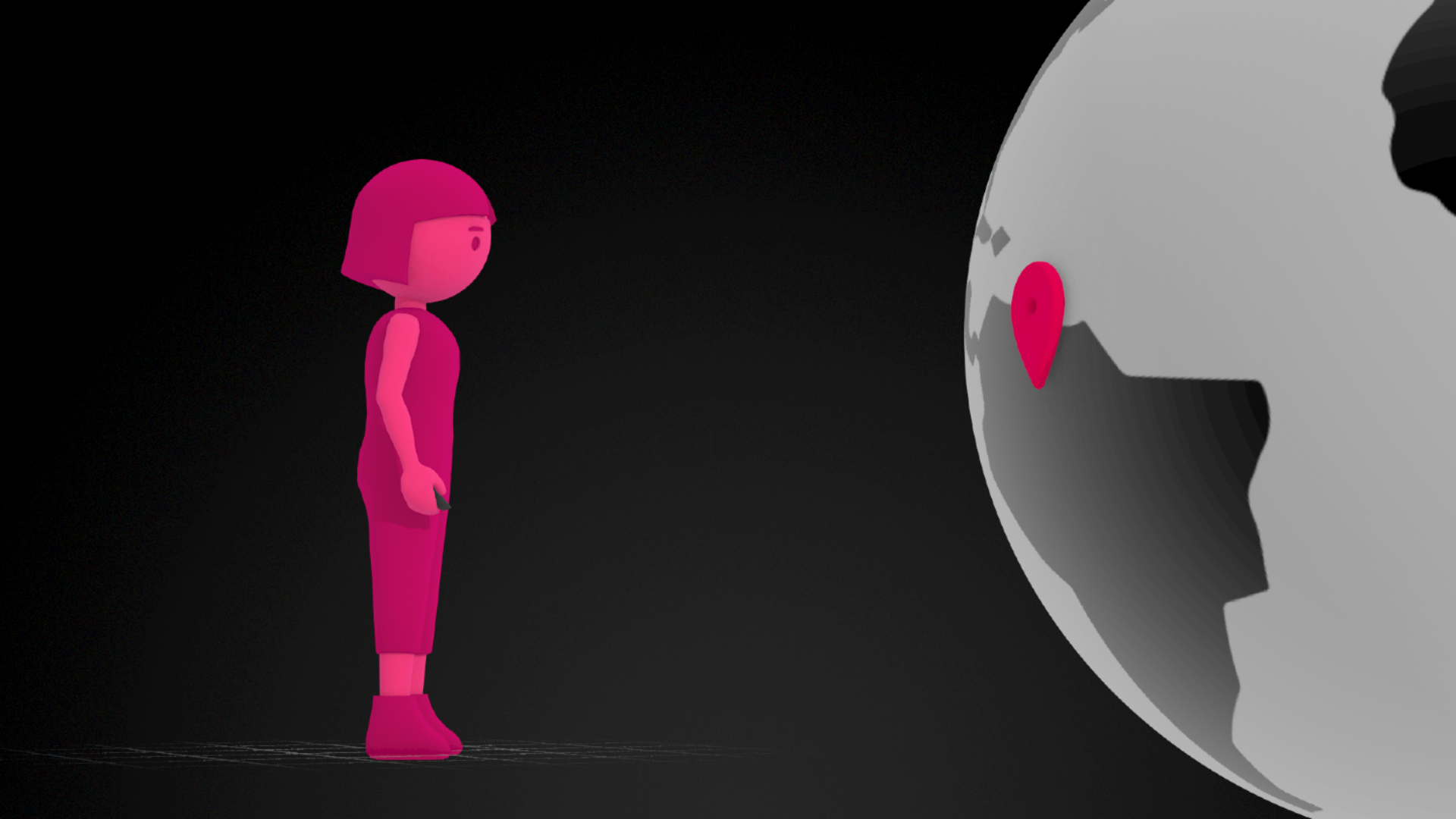
Search Pin

Central Park
New York, NY

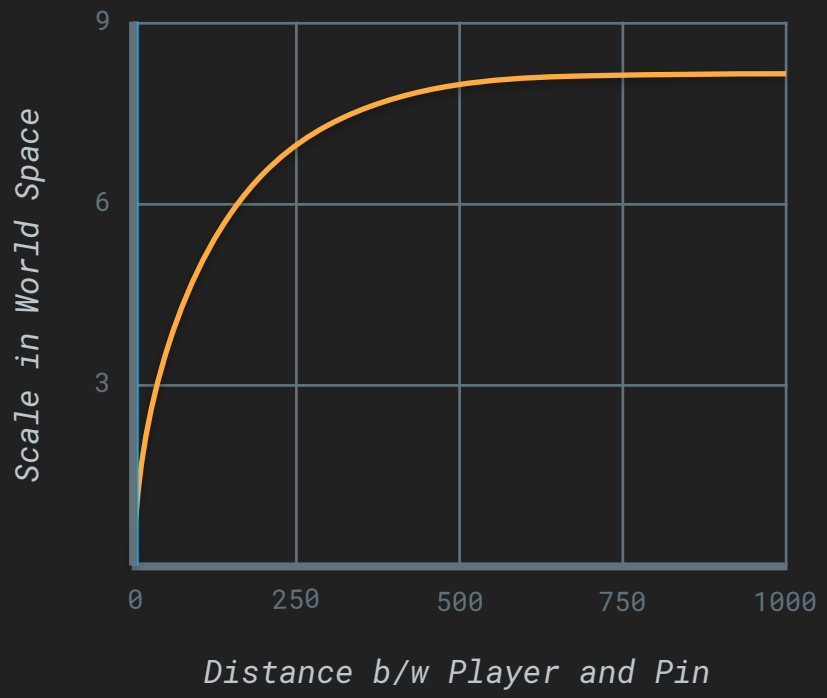






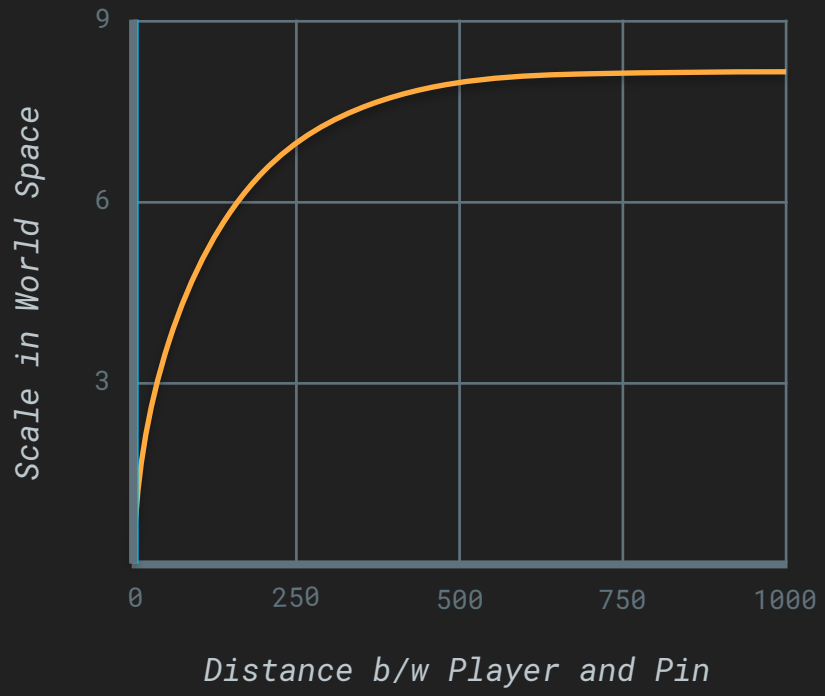


$$Scale = s_b * d^p$$


9
6
3
0
250
500
750
1000
Scale in World Space
Distance b/w Player and Pin

Central Park
New York, NY

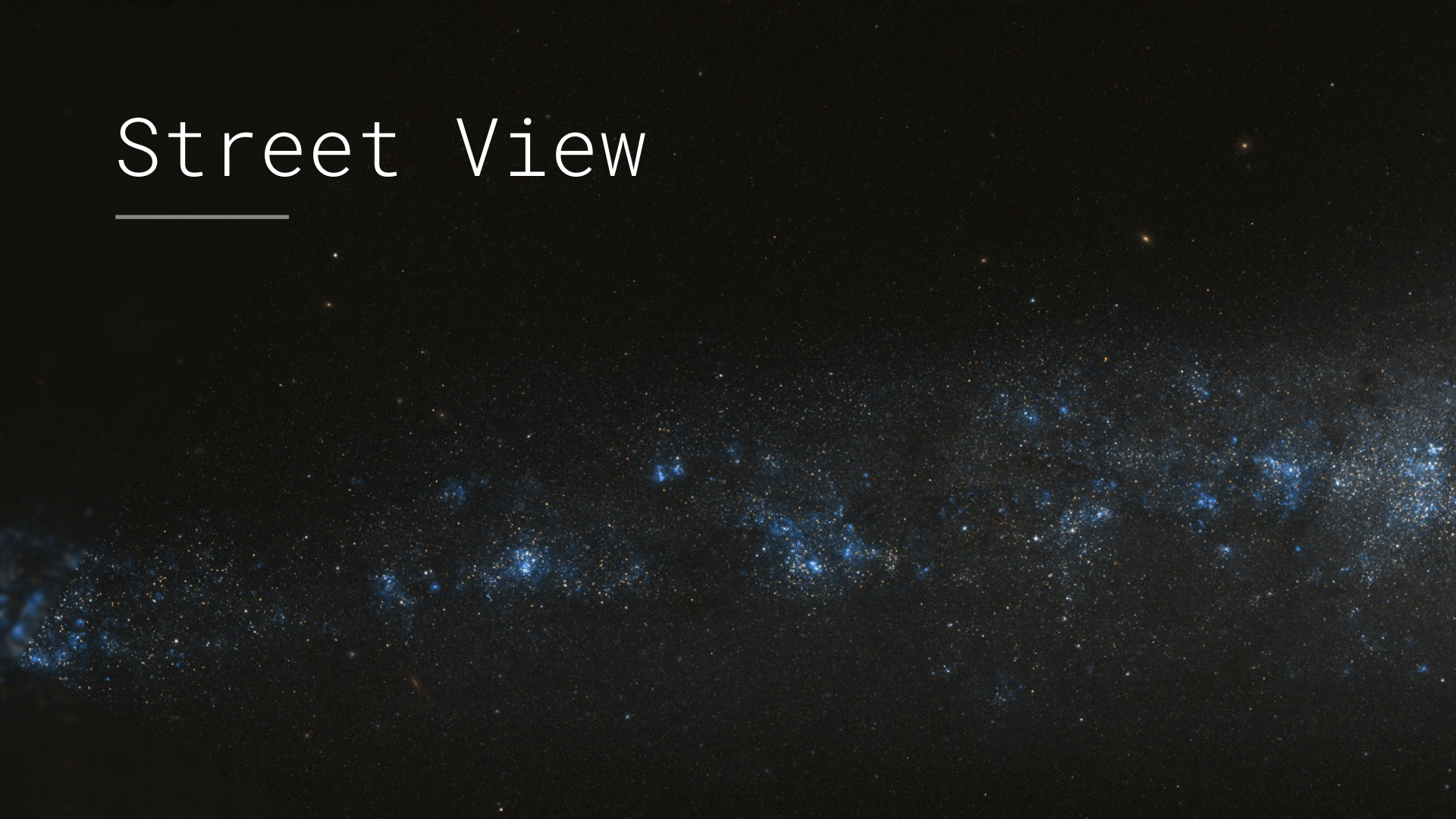
$$Scale = s_b * d^p$$


9
6
3
0
250
500
750
1000
Scale in World Space
Distance b/w Player and Pin

Central Park

1. Search text entry
2. Visible point of interest
3. Pin legibility

Street View

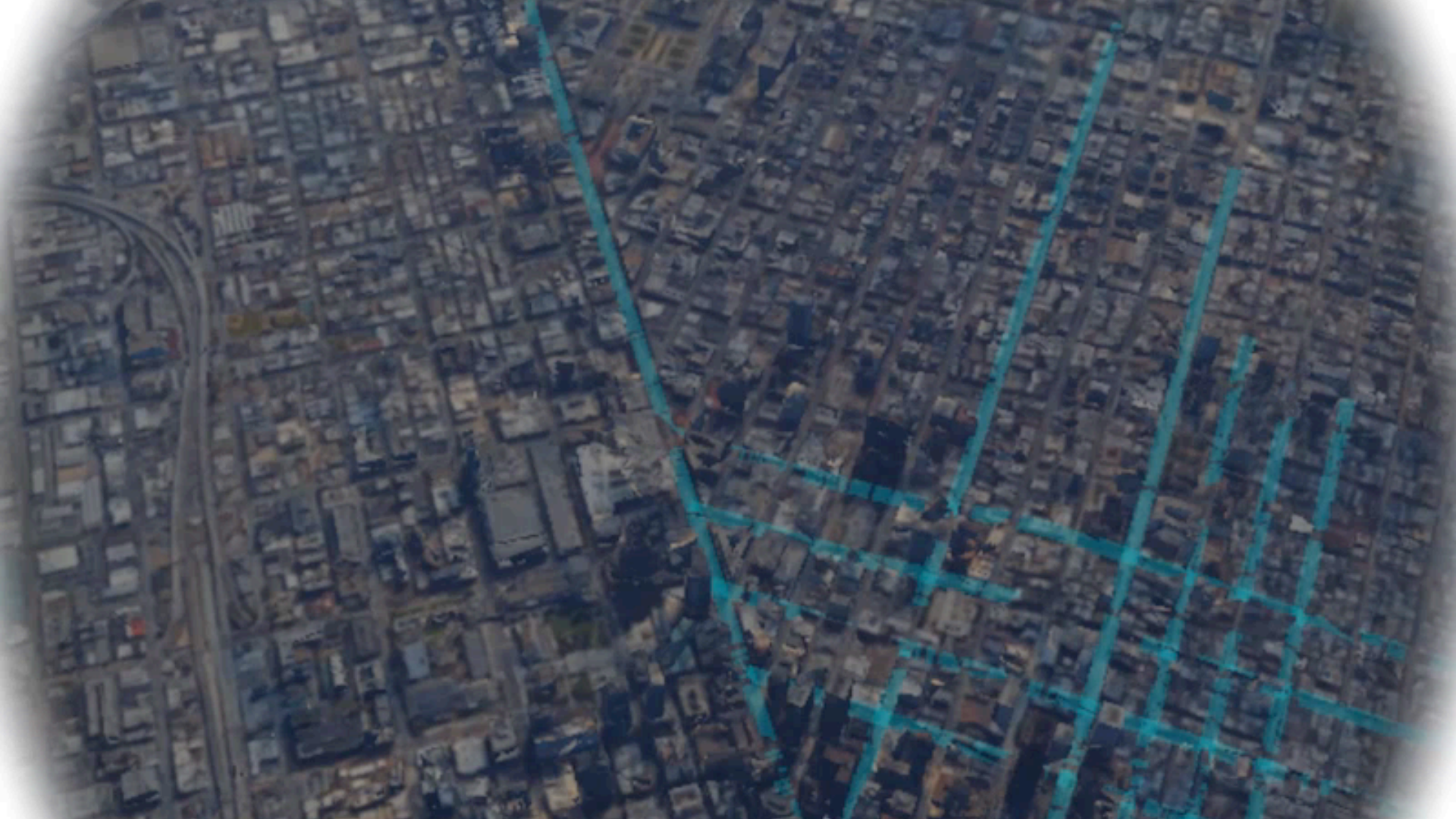


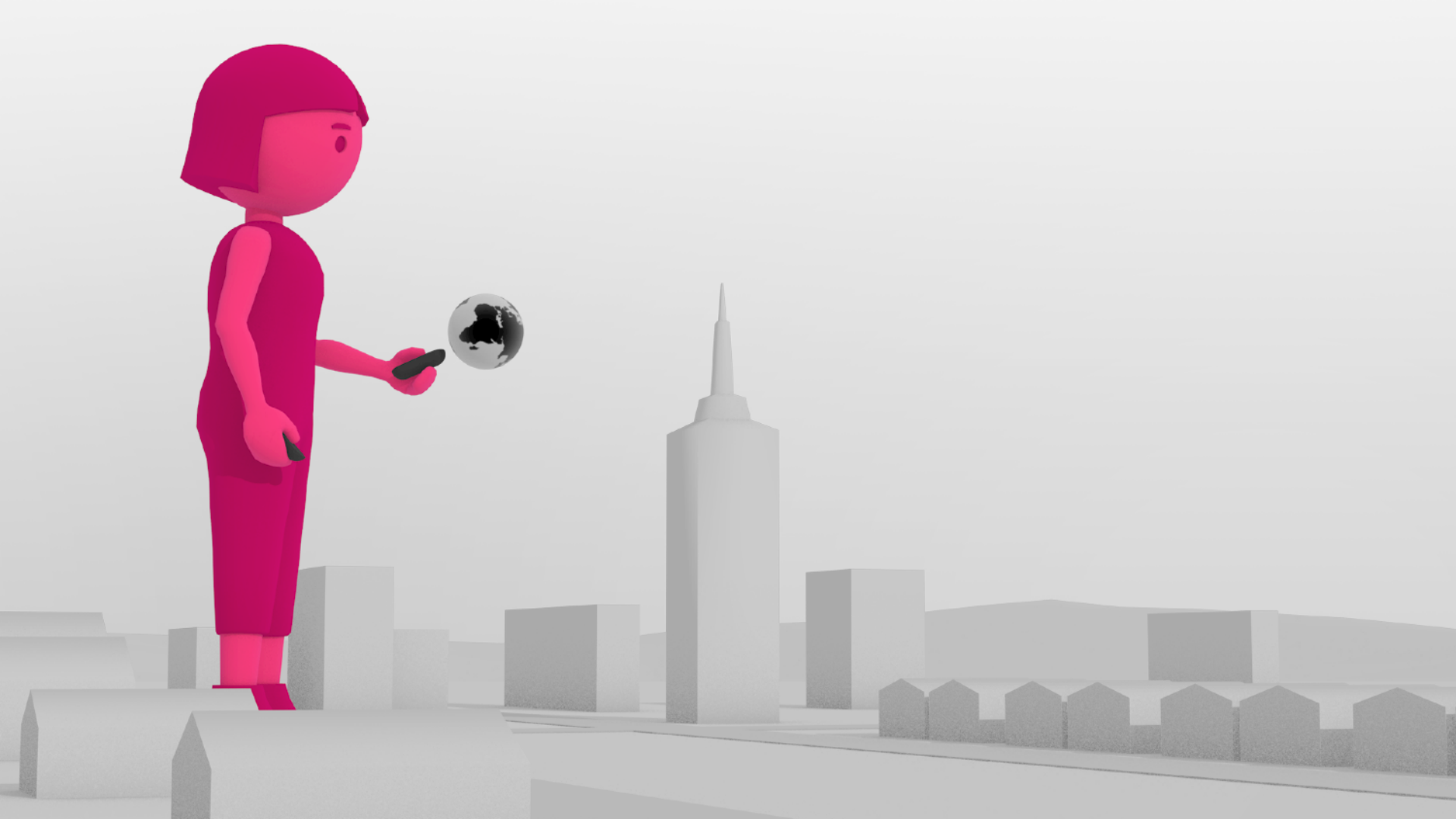
Tel Aviv-Yafo
Tel Aviv Marina
Doctors House
Masaryk Square
Light Wood Gallery
Beit Ha'ir
Meir Garden
Museum Tower
Ichilov Hospital
Sourasky Medical Center / Tourism
Tel Aviv Museum of Art
Hospital
Beit Ariela Library
Eyewear Museum
Kiryat HaSefer Park
Kiryat Sefer Park
The Hagana Museum
Maccabi Health Fund

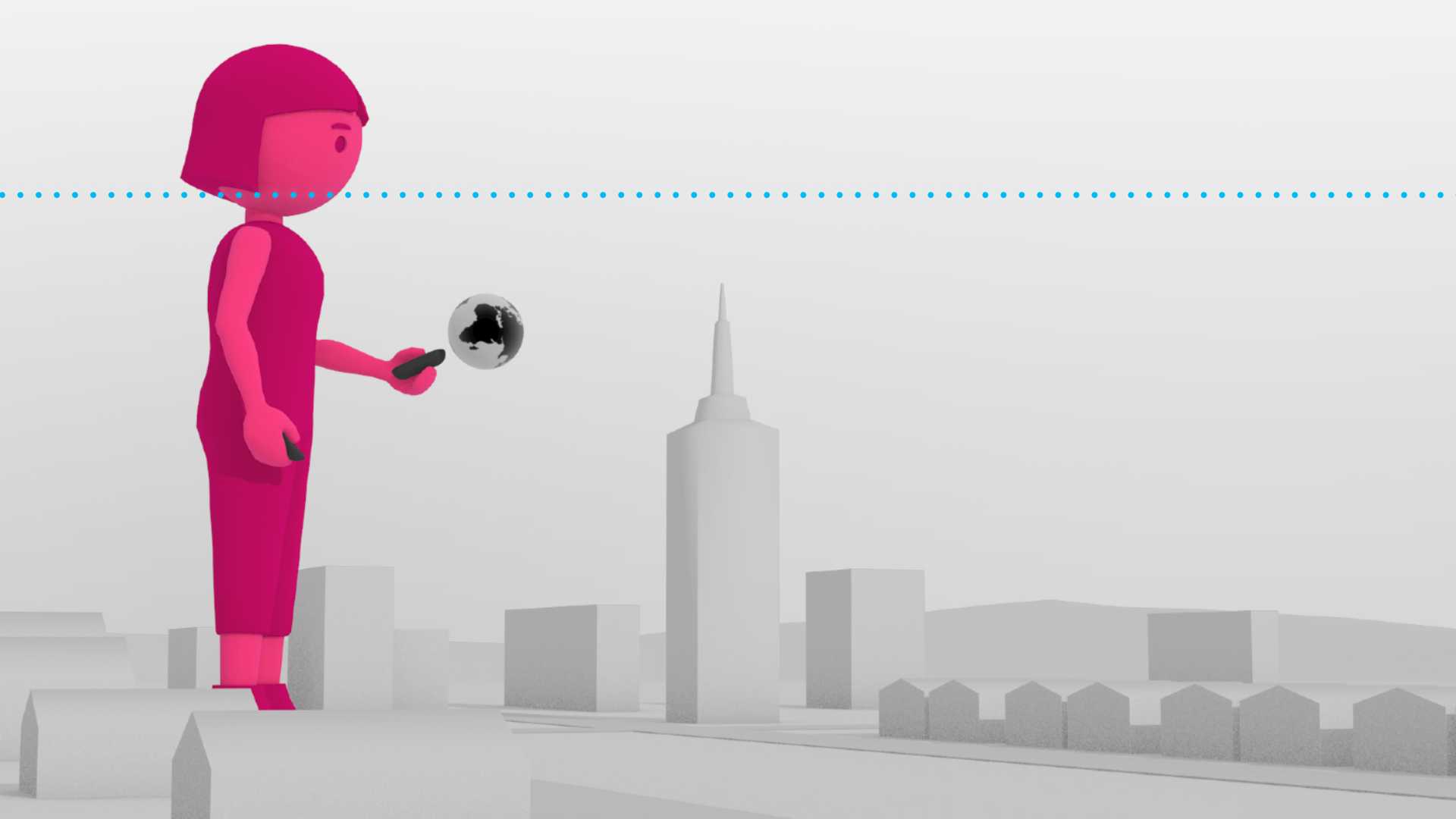
Google Earth VR

1. Street View availability
2. Entering / exiting

Street Boat Basin
Riverside Dr
West End Ave
Broadway
79 St
Amsterdam Ave
W 82nd St
W 83rd St
W 85th St
W 86th St
Central Park West
W 79th St
W 80th St
MANHATTAN
Central Park
81 Street-Museum of Natural History
American Museum of Natural History
Great Lawn
Beacon Theatre
New-York Historical Society
The Metropolitan Museum of Art
Riverside Blvd
Freedom Pl
W 71st St
W 70th St
W 73rd St
W 72nd St
W 74th St
The Lake
The Dakota
W 66th St
W 70th St
The Loeb Boathouse
Alice in Wonderland
Bethesda Fountain
W 64th St
Lincoln Center for the Performing Arts
W 61st St
W 60th St
W 59th St
W 62nd St
Sheep Meadow
CENTRAL PARK
West Dr
East Dr
Central Park Carousel
Balto Statue
Heckscher Playground
Hudson New York
Time Warner Center
Central Park Zoo
W 55th St
W 57th St
The Jewish Museum
Cooper Hewitt Smithsonian Design...
Madison Ave
Park Ave
96 St
E 96th St
Lexington Ave
96 St Subway
E 97th St
E 95th St
E 94th St
E 93rd St
2nd Ave
Neue Galerie New York
E 91st St
5th Ave
86 St Lexington Av
East 86th St
3rd Ave
86 St
1st Avenue
YORKVILLE
E 83rd St
York Ave
E 79th St
Lenox Hill Hospital
The Met Breuer
UPPER EAST SIDE
E 81st St
E 80th St
E 79th St
East End Ave
FDR Drive
E 72nd St
E 70th St
E 78th St
E 75th St
E 76th St
Hunter College
Second Avenue
68 Street
E 73rd St
E 74th St
E 71st St
Park Avenue Armory
E 70th St







San Francisco County
San Francisco, CA
Hold to save
Google Earth VR

San Francisco Bay
California
Street View Available
Google Earth VR

Google Earth VR

SF Hike - Great Chert Outcrop
San Francisco, CA 94114
Street View Available
Hold to save
Tilt Earth up
Google Earth VR

1. Discoverability on controller
2. Intuitive enter/exit

thank you