Let’s Scroll

ScrollView from Zero

Ratnesh Jain

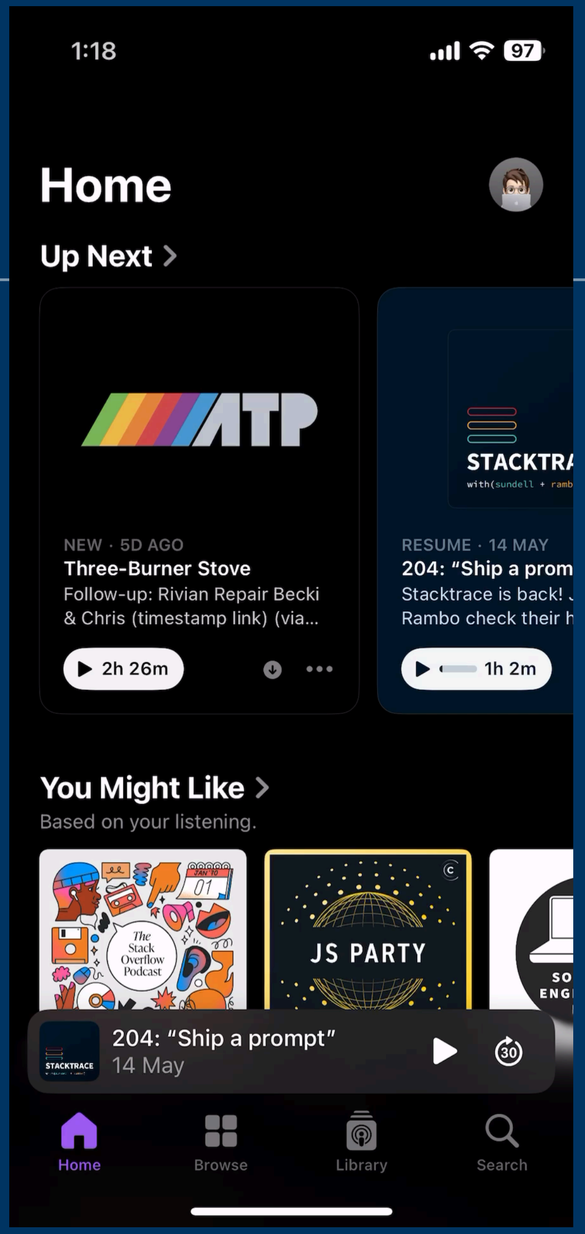
Today

- **Necessity of ScrollView**
- **Why UIScrollView now?**
  - In the time of SwiftUI
- **Coordinates**
  - Cartesian
- **Physics**
  - FoR, Time, Distance, Velocity, Acceleration
- **Some Code**
  - ScrollView

Necessity of ScrollView

Why Study ScrollView

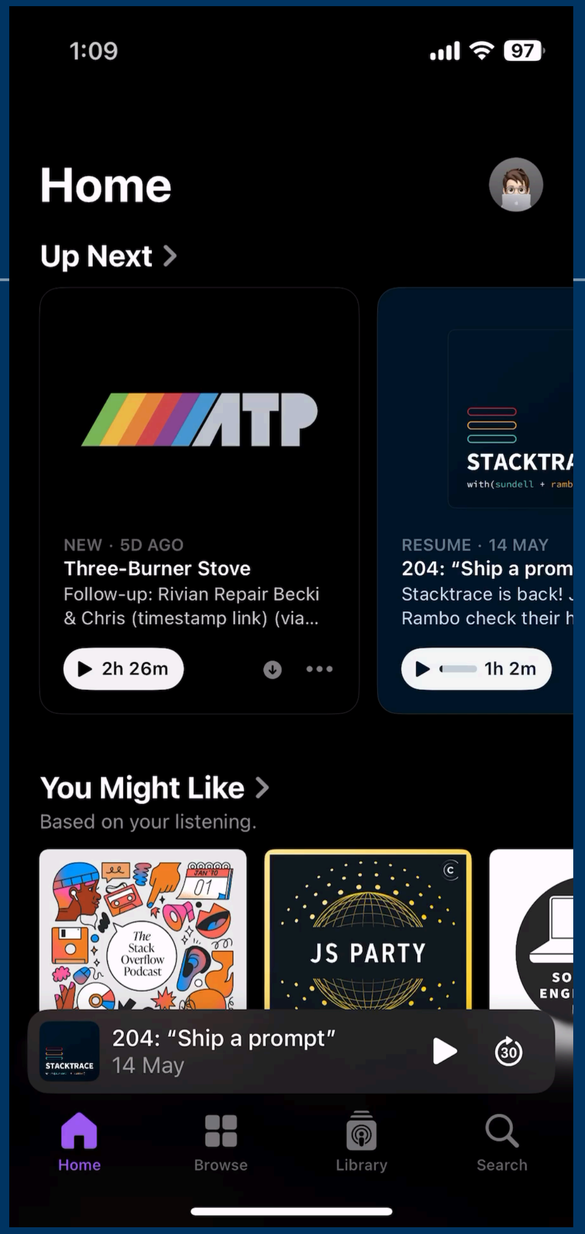
- Very Large content to show



Necessity of ScrollView

Why Study ScrollView

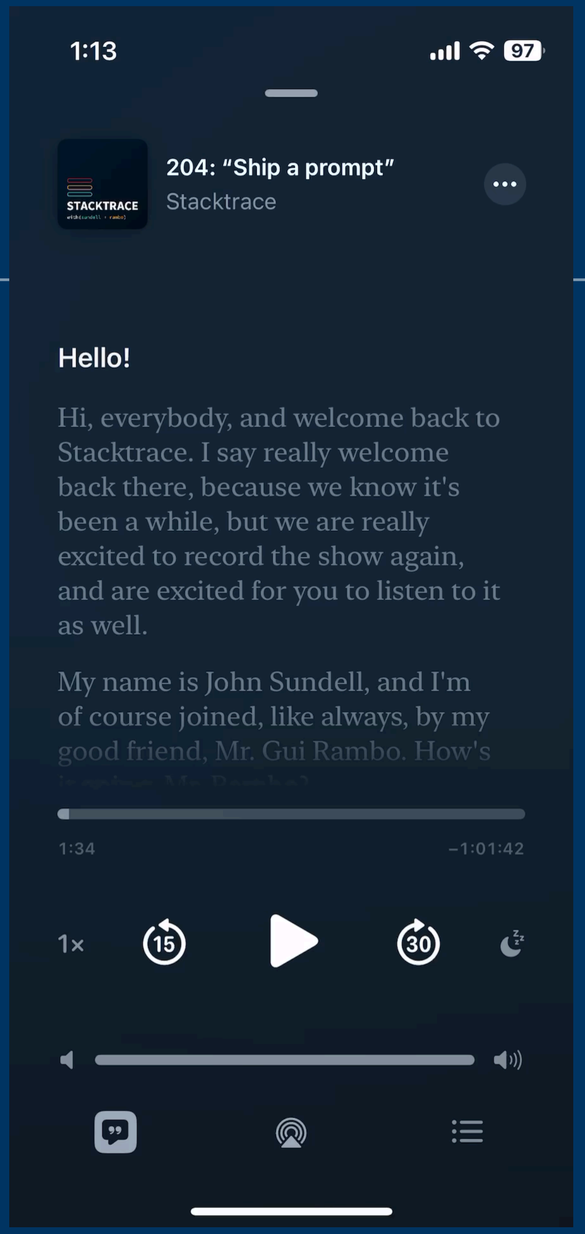
- Very Large content to show
- Unified smooth scrolling



Necessity of ScrollView

Why Study ScrollView

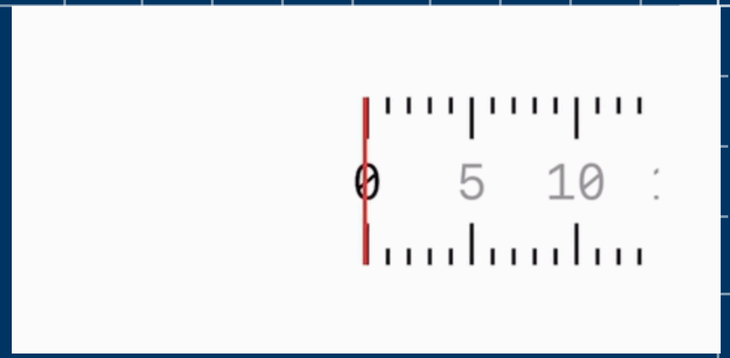
- Very Large content to show
- Unified smooth scrolling
- Better keyboard obstruction handling



Necessity of ScrollView

Why Study ScrollView

- Very Large content to show
- Unified smooth scrolling
- Better keyboard obstruction handling
- Unique style of controls/components



Ref: https://uvolchyk.medium.com/scrolling-pickers-in-swiftui-de4a9c653fb6

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Why ScrollView Now?

In the Era of SwiftUI

- What should I learn ?
  - SwiftUI or UIKit?

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Begin with SwiftUI

Why ScrollView Now?

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SwiftUI uses other(existing) technologies for rendering for some parts

When SwiftUI sees “Never” type in the View Tree

Metal, Core Animation, Core Graphics, Core Text, UIKit*, AppKit* …

Why ScrollView Now?

In the Era of SwiftUI

- What should I learn?
  - SwiftUI or UIKit?

If we want be CREATIVE in those parts, We should LEARN it

Ratnesh Jain

Why ScrollView Now?

In the Era of SwiftUI

- What should I
  - SwiftUI or UIKi


```
Image(systemName: "figure.run.circle.fill")
    .font(.system(size: 300))
    .colorEffect(ShaderLibrary.checkerboard(.float(10), .color(.blue)))
```

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Image(systemName: "figure.run.circle.fill")
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Image(systemName: "figure.run.circle.fill")
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Why ScrollView Now?

In the Era of SwiftUI

- What should I learn ?
  - SwiftUI or UIKit?

Metal

Available since 2014

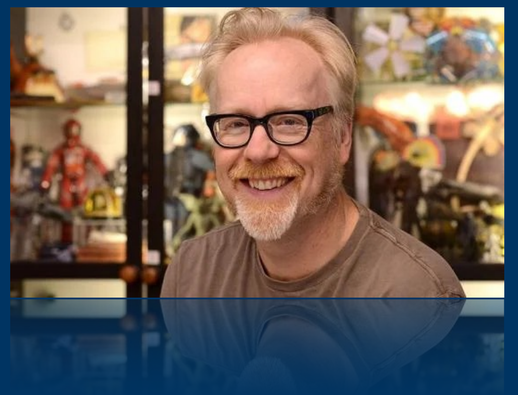
Why ScrollView Now?

In the Era of SwiftUI

- What should I learn ?
  - SwiftUI or UIKit?
- How do I Learn it?

- Whenever I had trouble understanding a concept.

Adam Savage (from **Myth Busters**)



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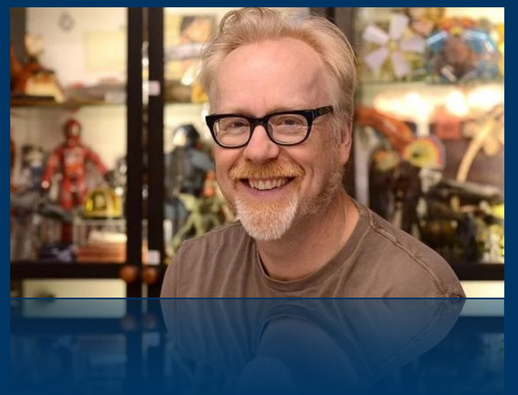
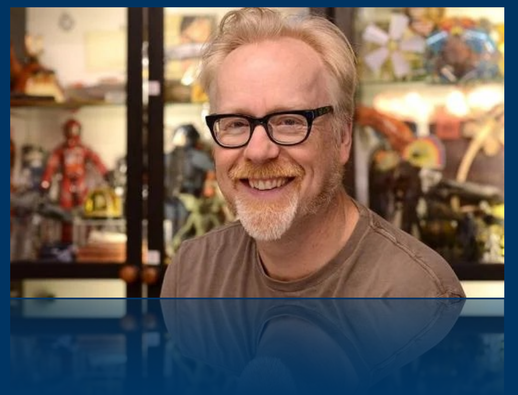


- Whenever I had trouble understanding a concept.
- I go back and I research people who discovered the concept.
- I look at the story how they come to understand it.

Adam Savage (from **Myth Busters**)
How simple ideas lead to scientific discoveries (Ted talk)



“I am a big fan of Mike Ash’s Let’s Build … series of articles”

Quote from “Understanding UIScrollView”

by **Ole Begemann**

Co-author of “Advanced Swift”

Ratnesh Jain

Mike Ash's Let's Build

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at (2015-09-04 13:22)

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https://mikeash.com/pyblog/?tag=letsbuild

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- What are the benefits?

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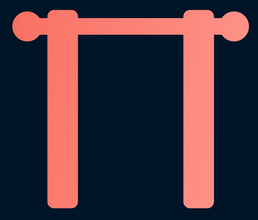
Help us understand 

behind the scene 

 Machinery

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Better understanding of the NEW APIs

Ratnesh Jain

Why ScrollView Now?

In the Era of SwiftUI

- What should I learn ?
  - SwiftUI or UIKit?
- Should I learn ?
- What are the benefits?

Help us take Better decisions.

Why ScrollView Now?

In the Era of SwiftUI

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- How do I Learn it?
- What are the benefits?
  - Help us understand behind the scene machinery
  - Better understanding of the new APIs
  - Help us take better decisions.

Today

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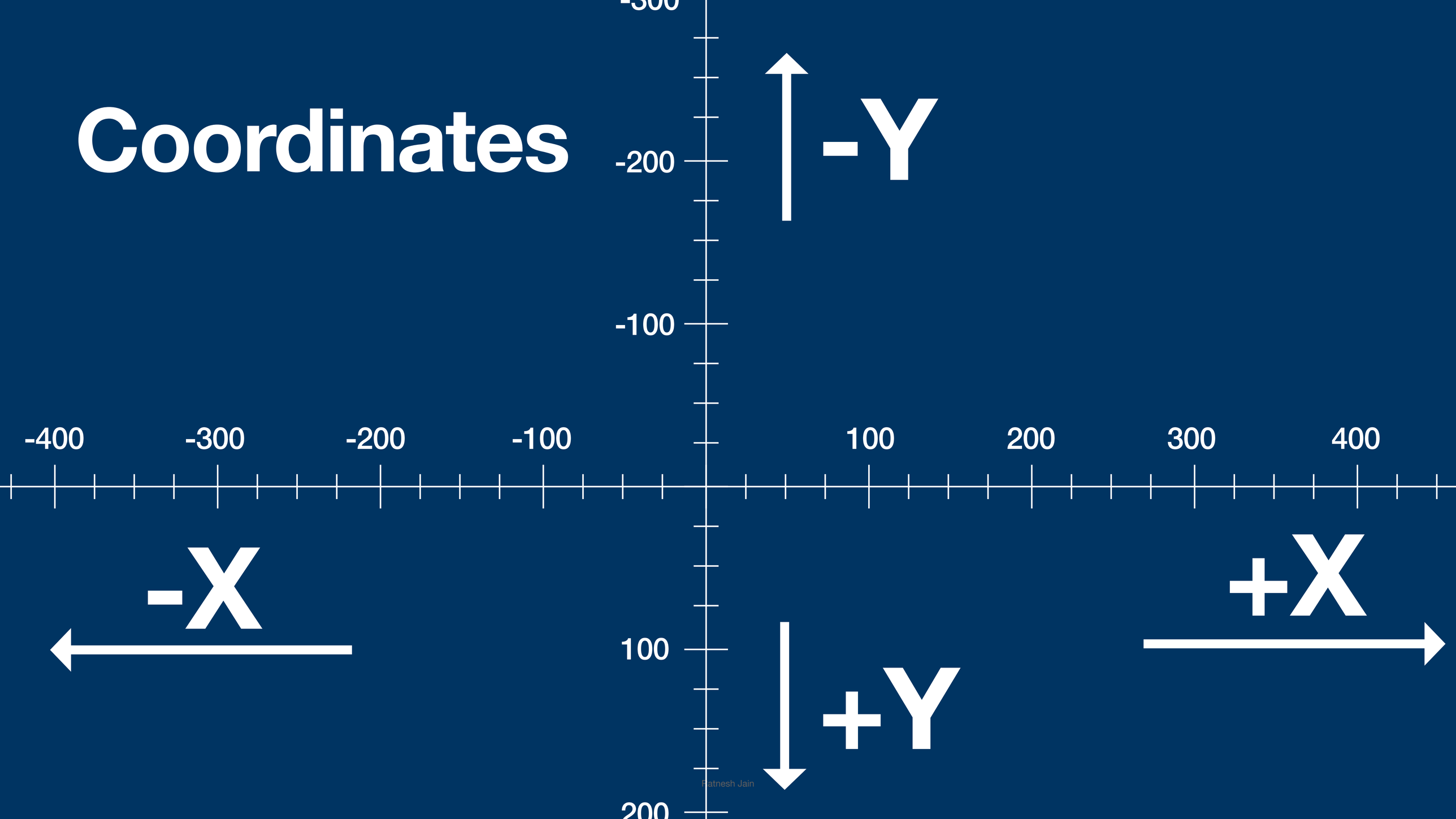
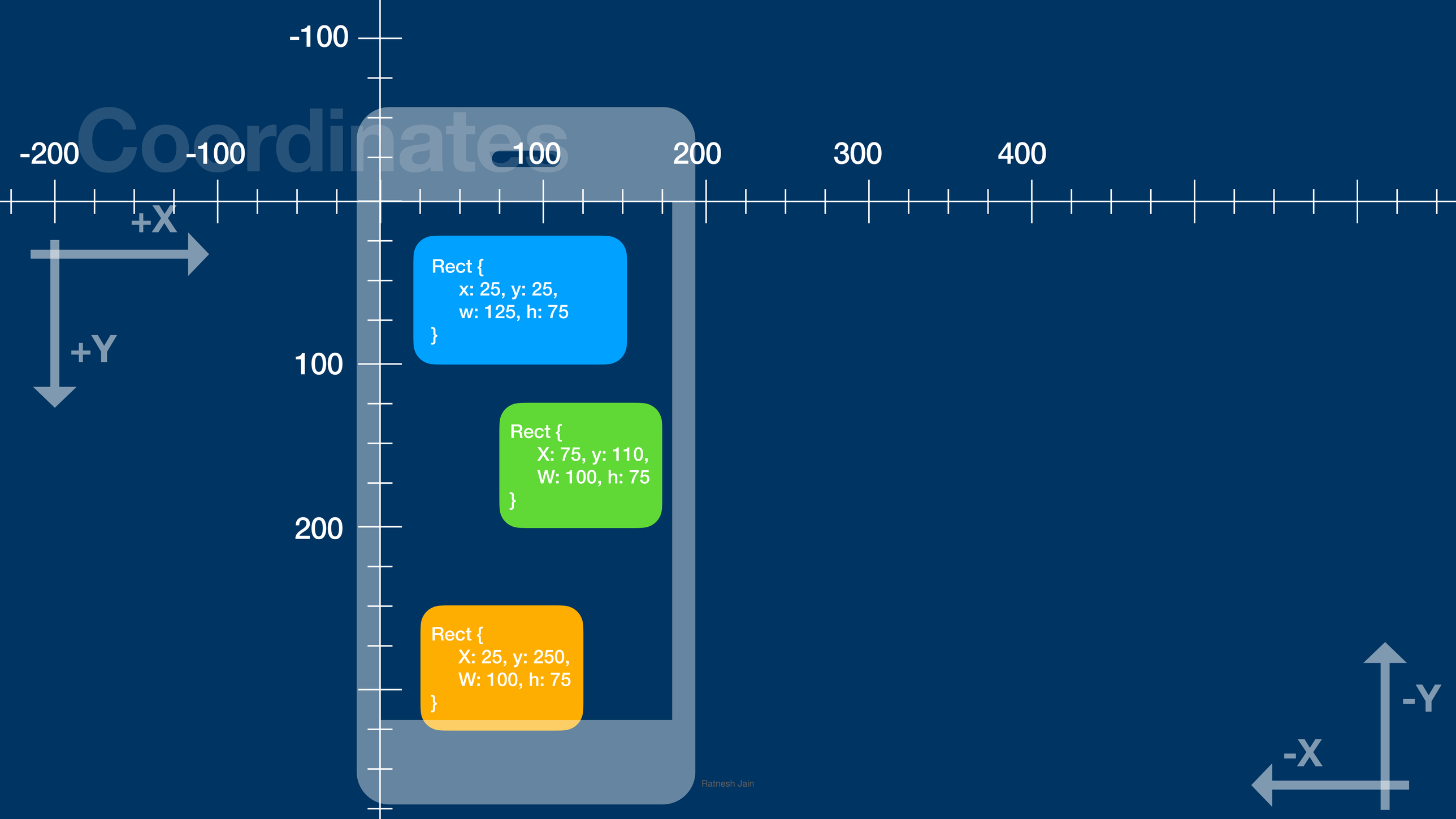
- **Coordinates**
  - Cartesian
- **Physics**
  - FoR, Time, Distance, Velocity, Acceleration
- **Some Code**
  - ScrollView

Coordinates




Coordinates
-100
-200
-100
100
200
300
400
+X
+Y
Rect {
x: 25, y: 25,
w: 125, h: 75
}
100
Rect {
X: 75, y: 110,
W: 100, h: 75
}
200
Rect {
X: 25, y: 250,
W: 100, h: 75
}
-Y
-X
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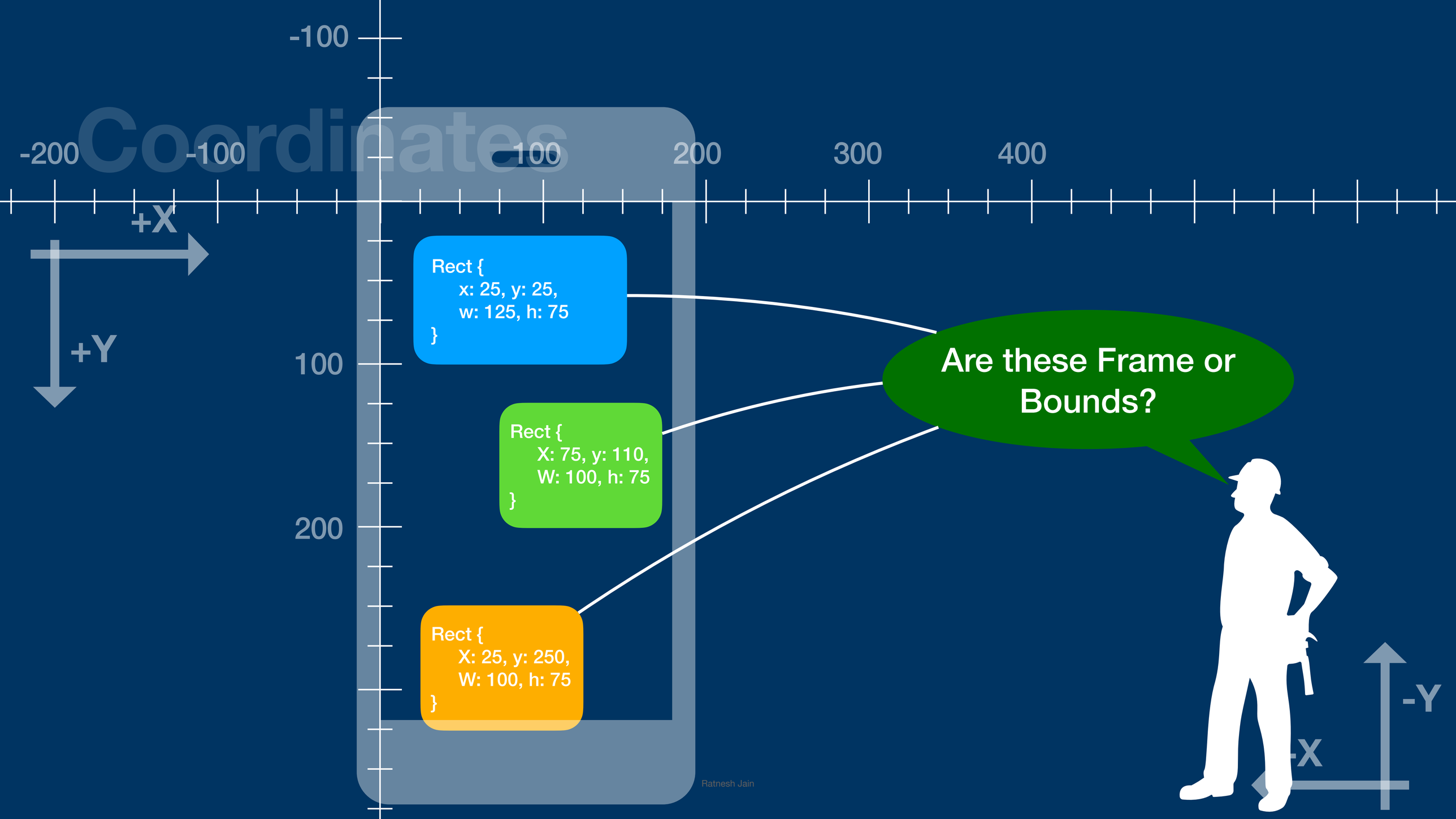
Coordinates
-200
-100
100
200
300
400
-100
100
200
+X
+Y
Rect {
x: 25, y: 25,
w: 125, h: 75
}
Rect {
X: 75, y: 110,
W: 100, h: 75
}
Rect {
X: 25, y: 250,
W: 100, h: 75
}
Are these Frame or Bounds?
-Y
-X
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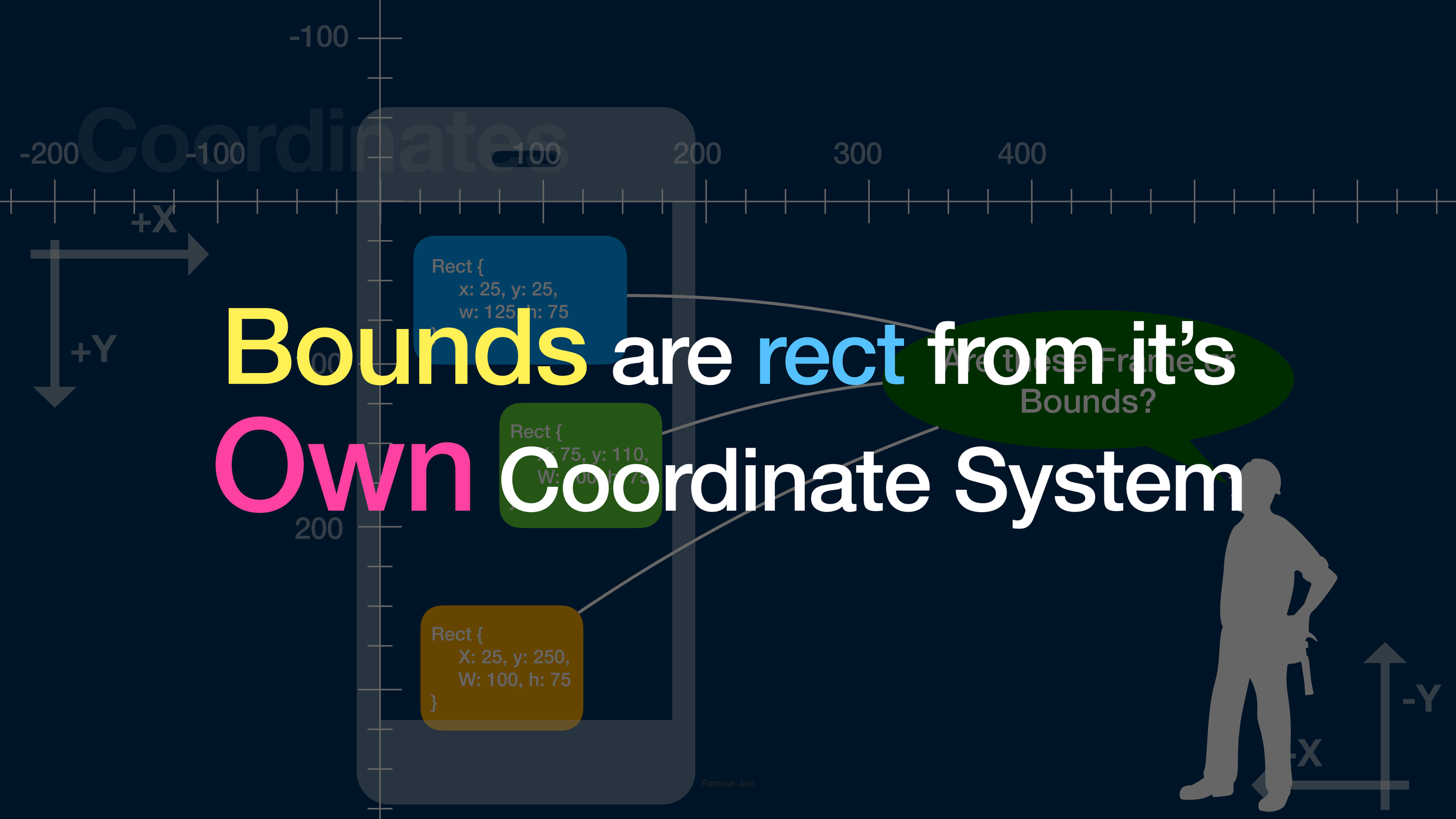
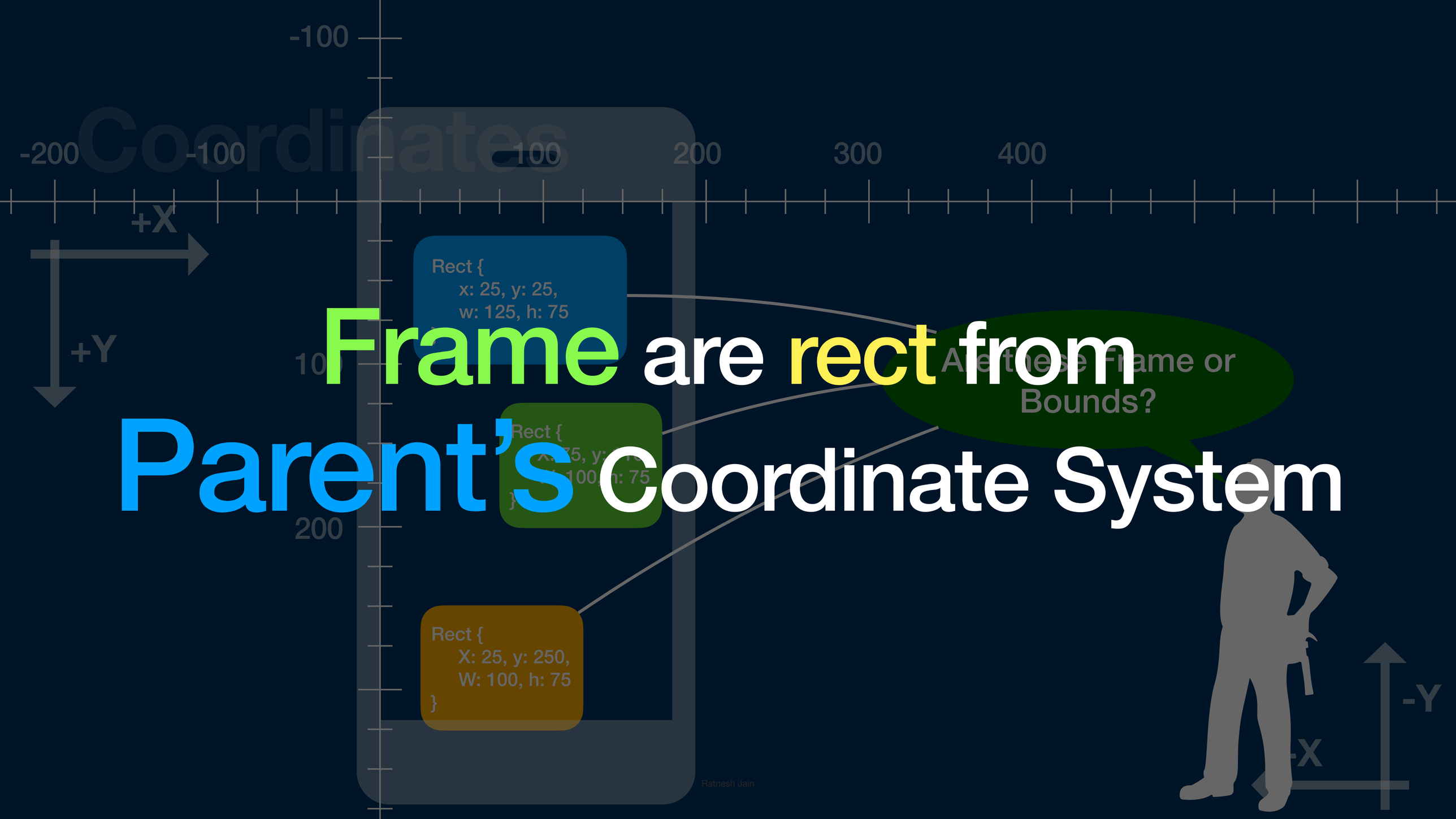
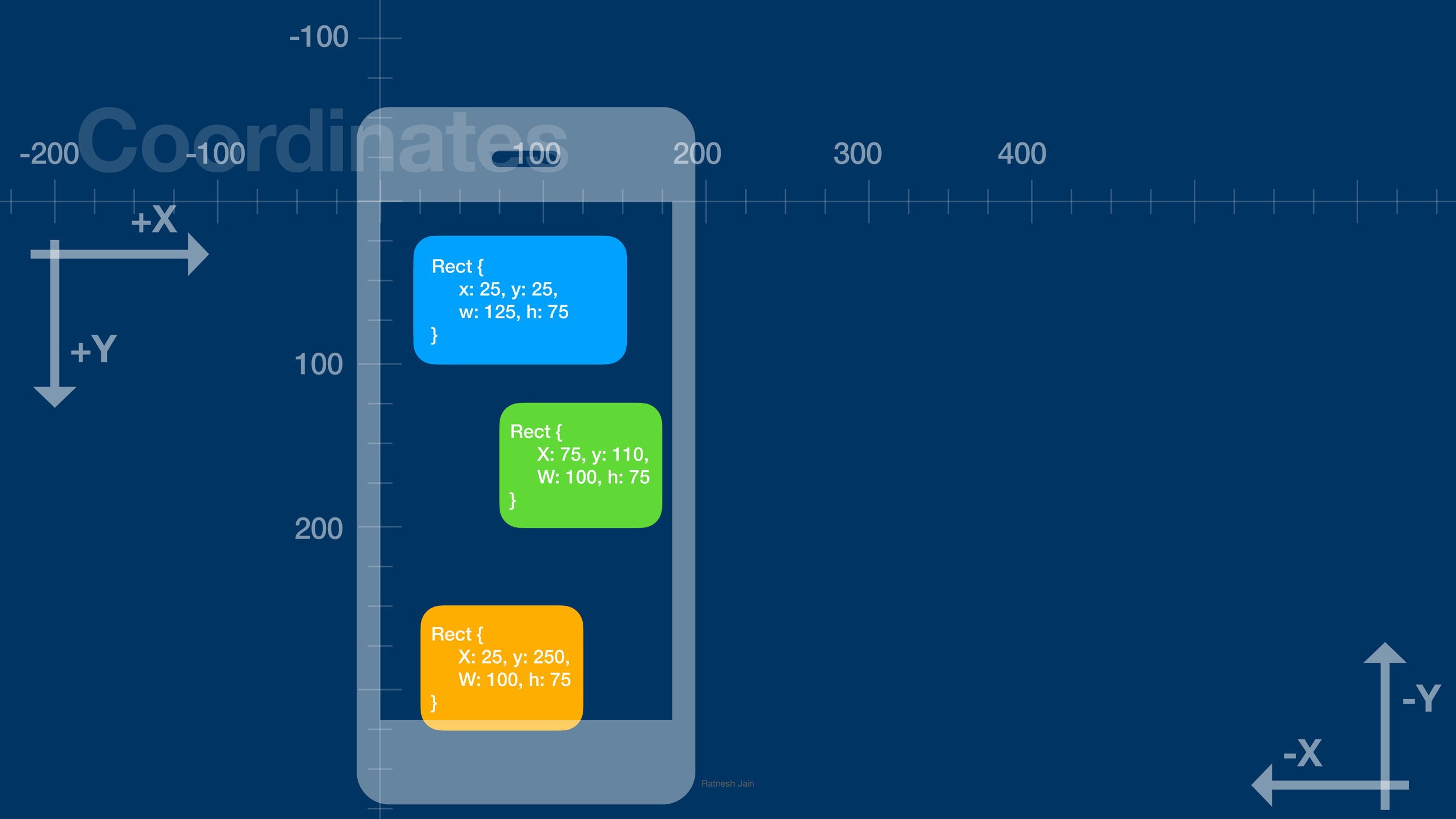


Bounds are rect from it's Own Coordinate System



Frame are rect from Parent's Coordinate System

Coordinates



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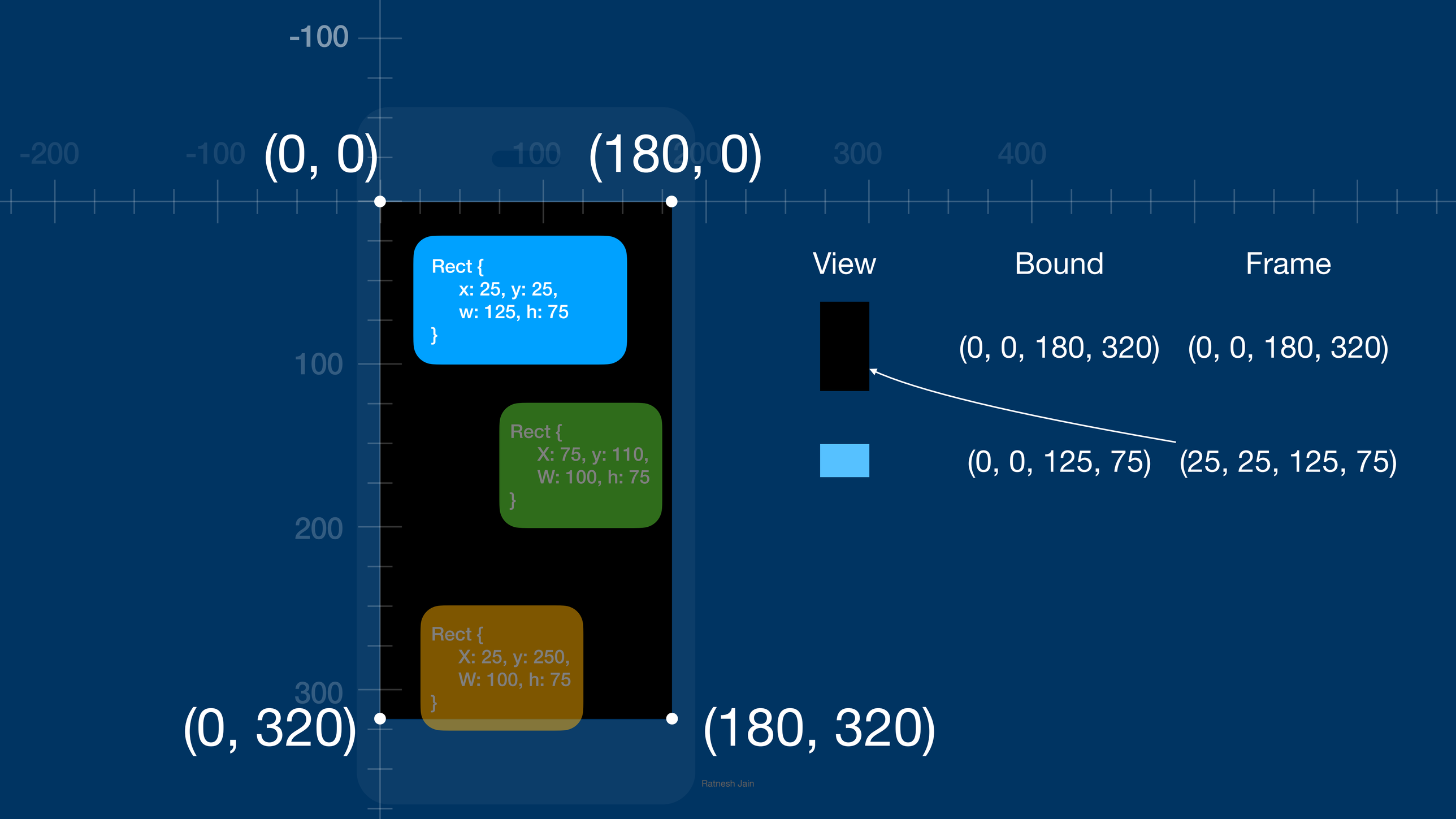
-100
-200
-100
100
200
300
400
(0, 0)
(180, 0)
100
200
300
(0, 320)
(180, 320)
Rect {
x: 25, y: 25,
w: 125, h: 75
}
Rect {
X: 75, y: 110,
W: 100, h: 75
}
Rect {
X: 25, y: 250,
W: 100, h: 75
}
View
Bound
Frame
(0, 0, 180, 320)
(0, 0, 180, 320)
(0, 0, 125, 75)
(25, 25, 125, 75)
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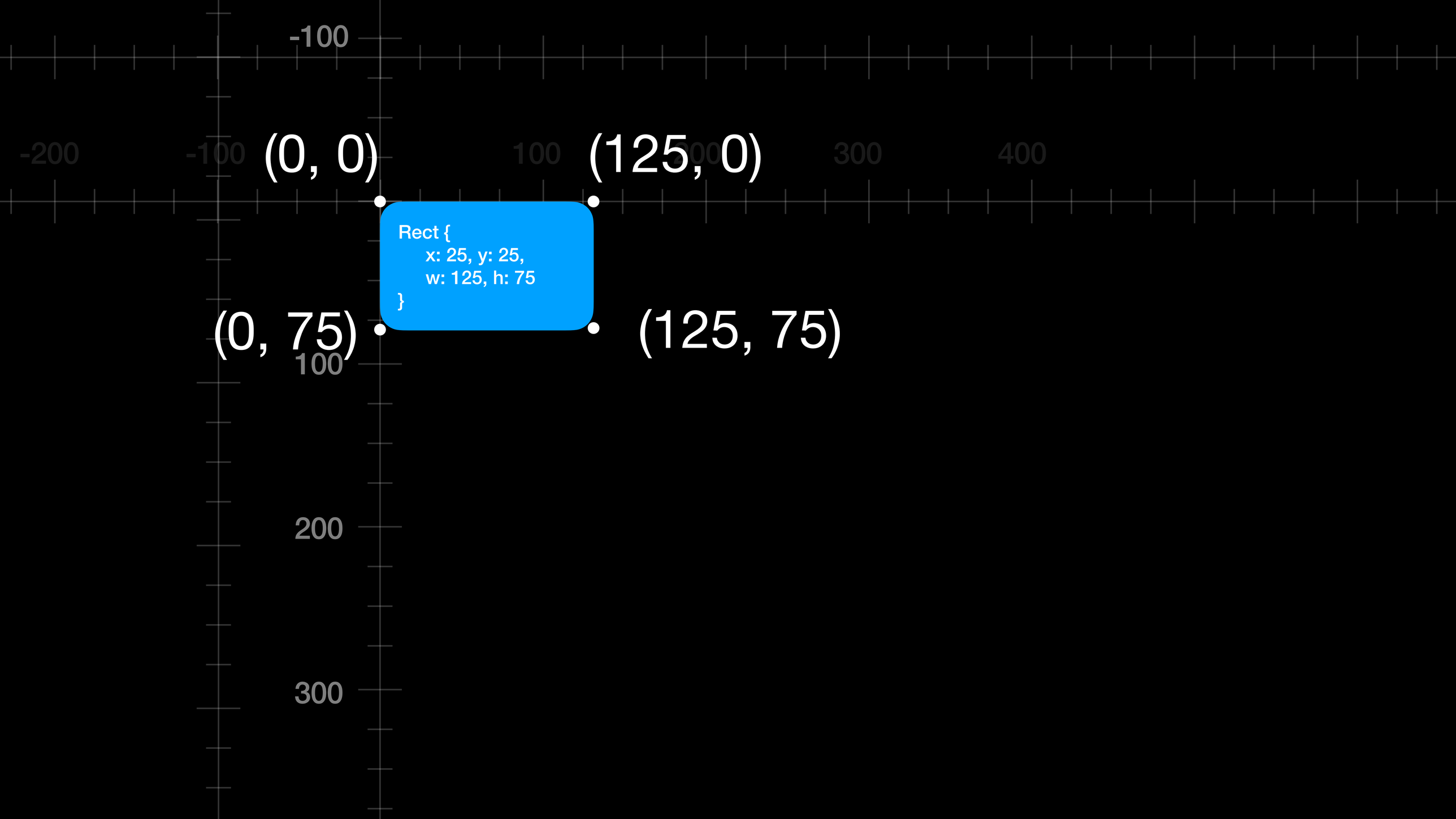
-100
-200
-100
100
200
300
400
(0, 0)
(125, 0)
Rect {
x: 25, y: 25,
w: 125, h: 75
}
(0, 75)
(125, 75)
100
200
300

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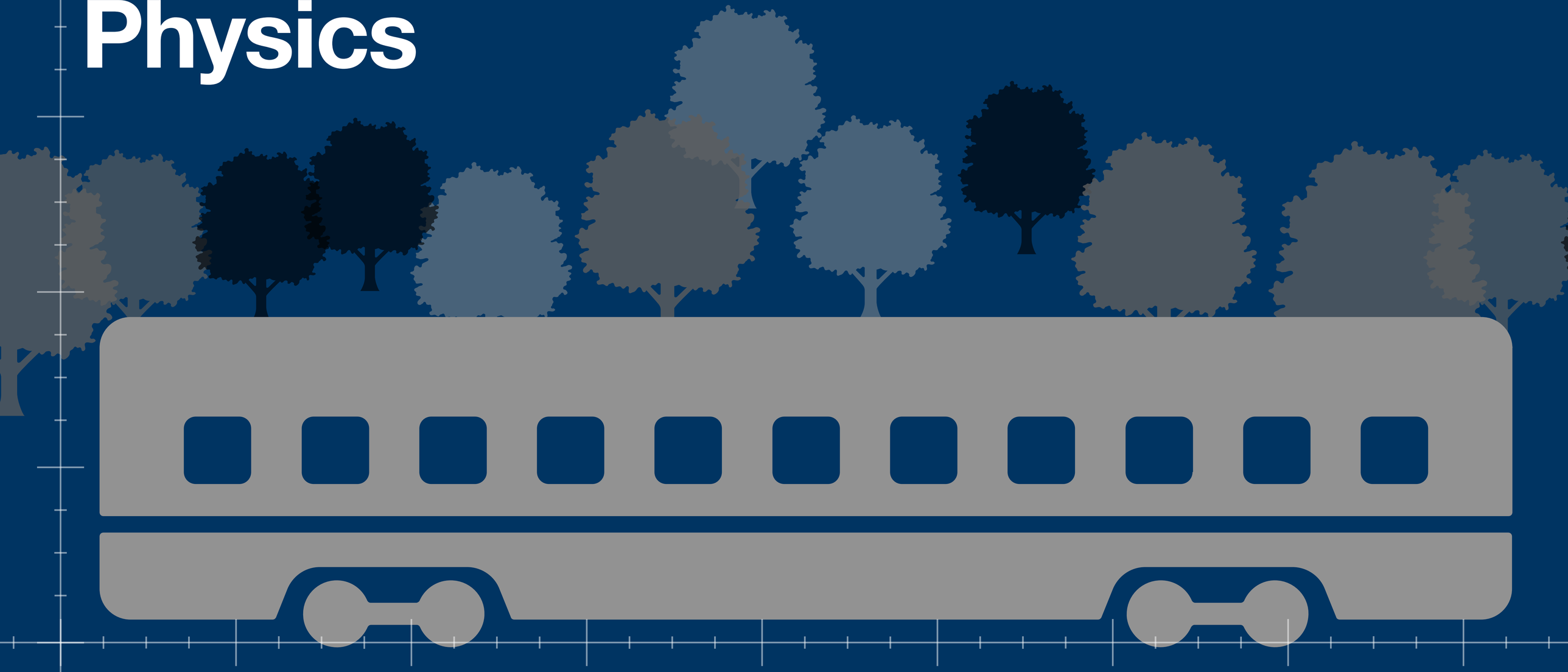

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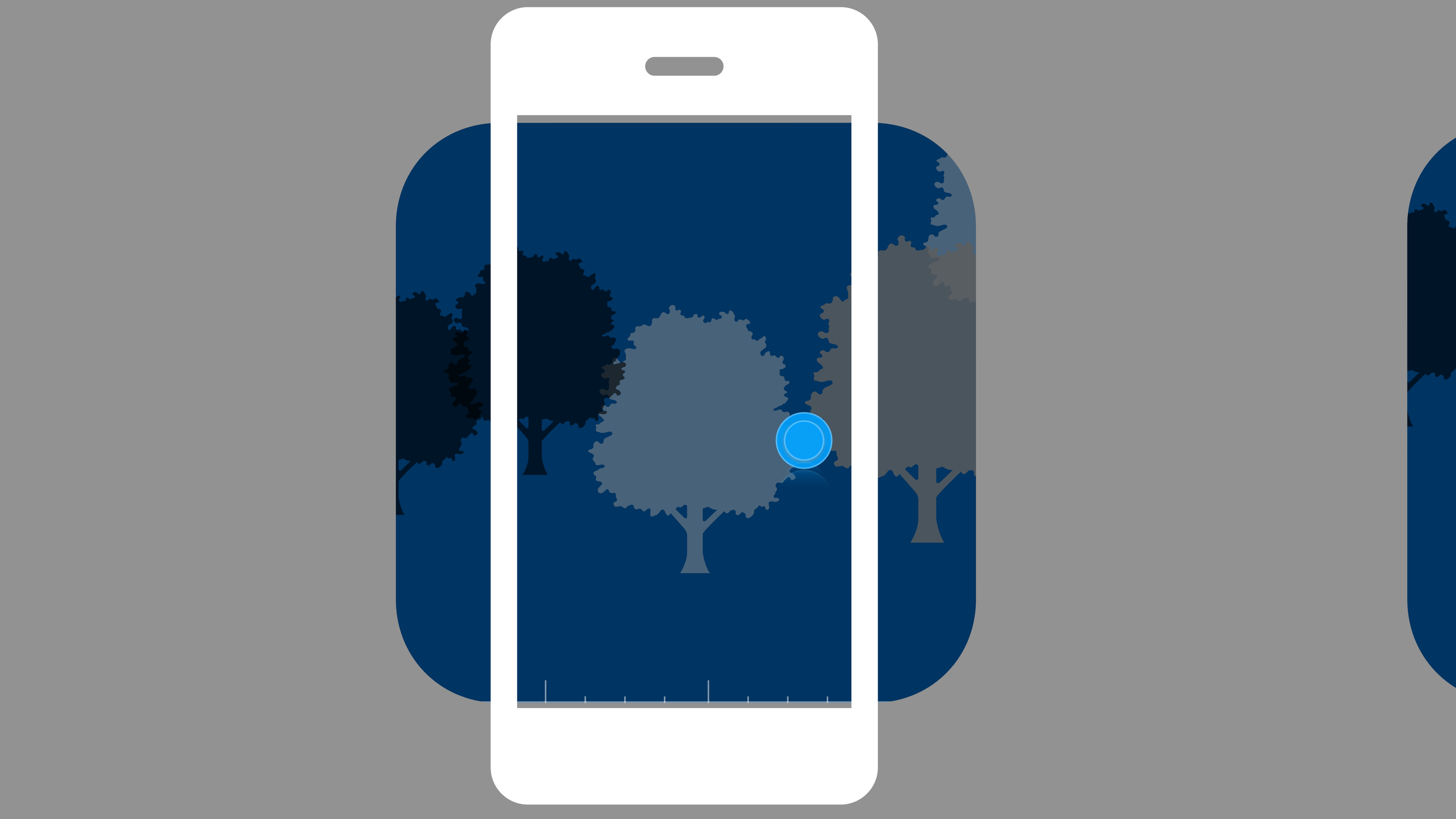


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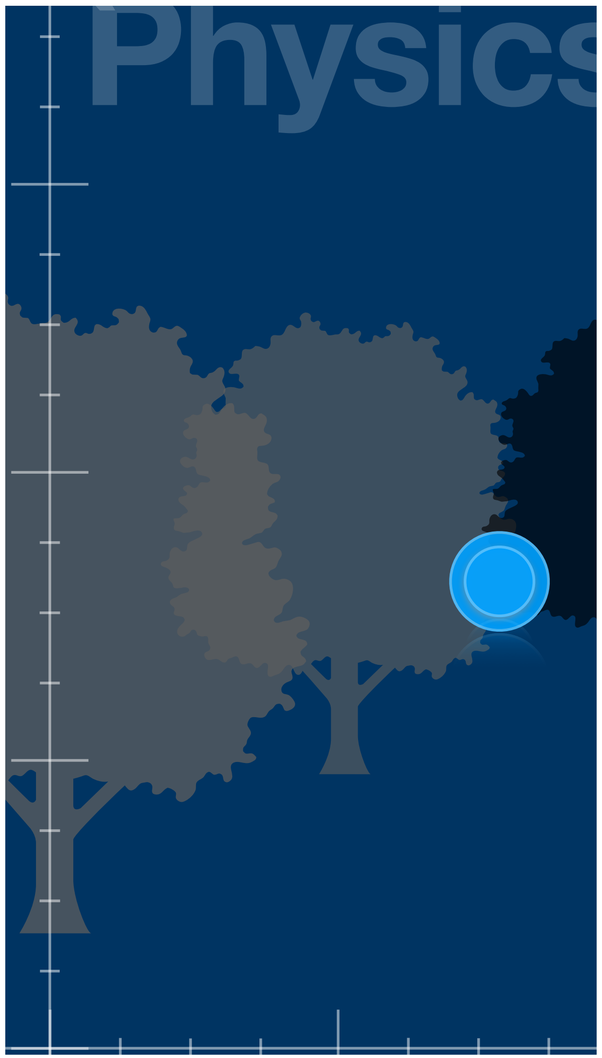
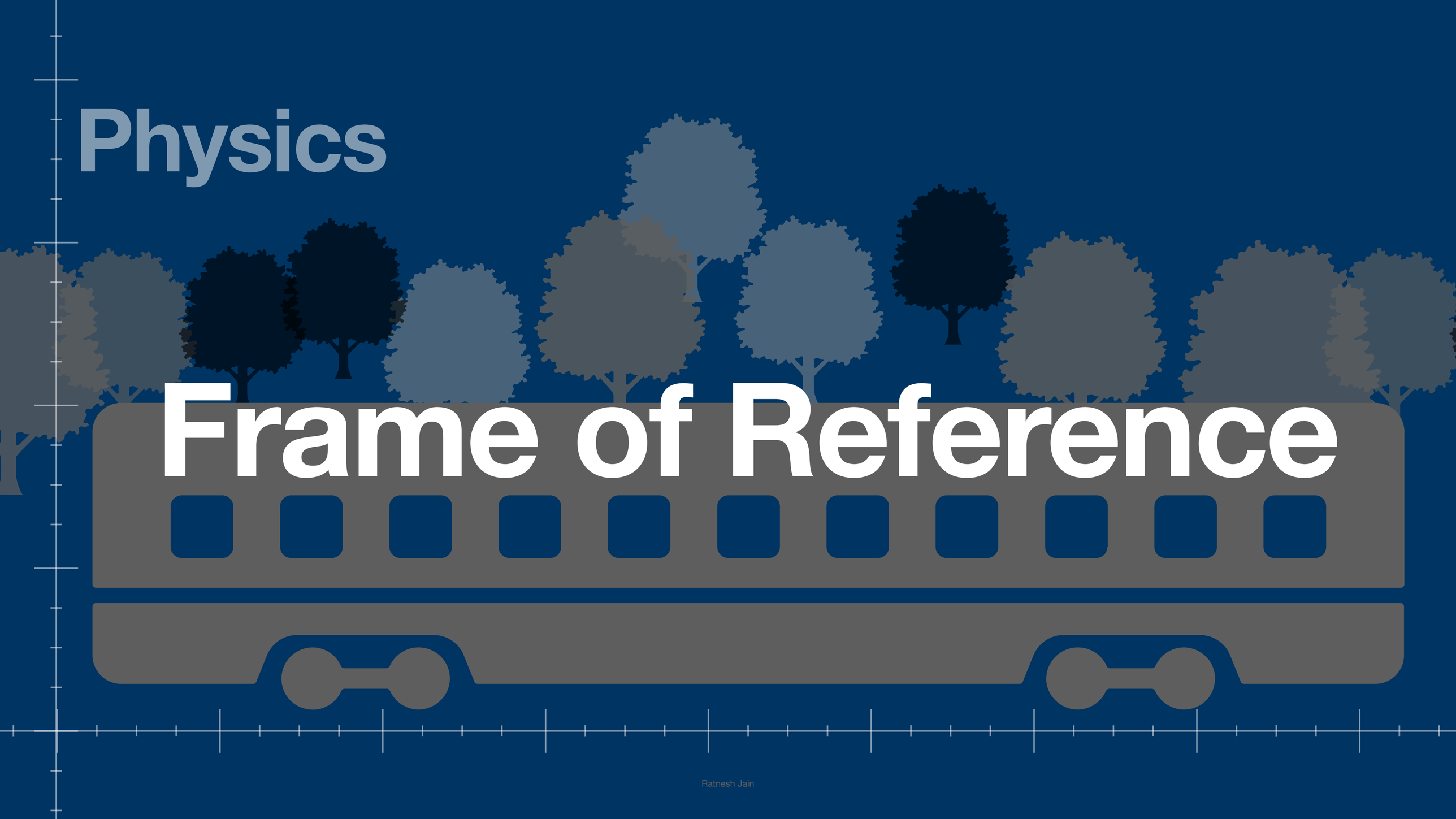

Physics

Physics

Frame of Reference



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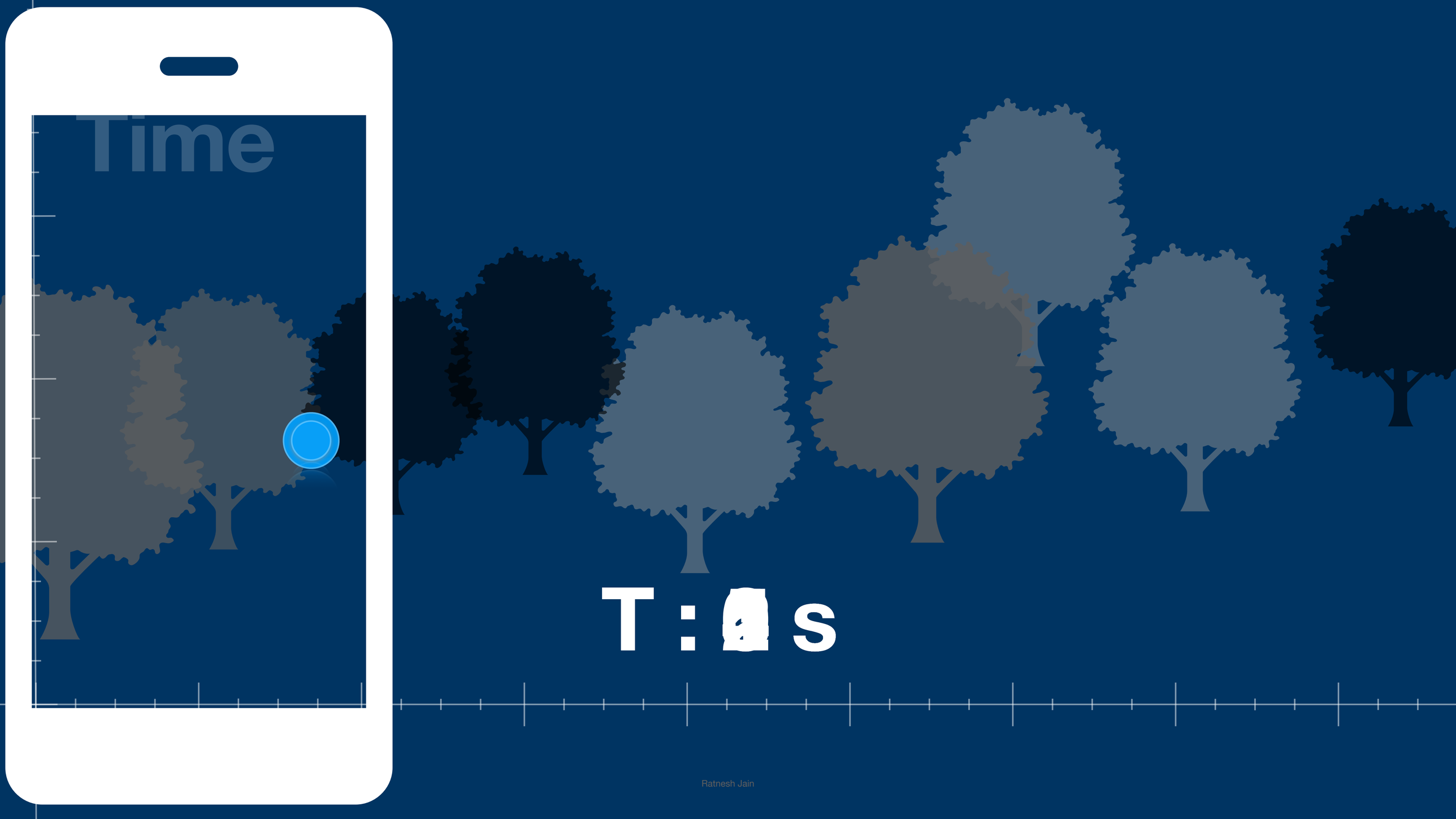
Time


Time
T : s

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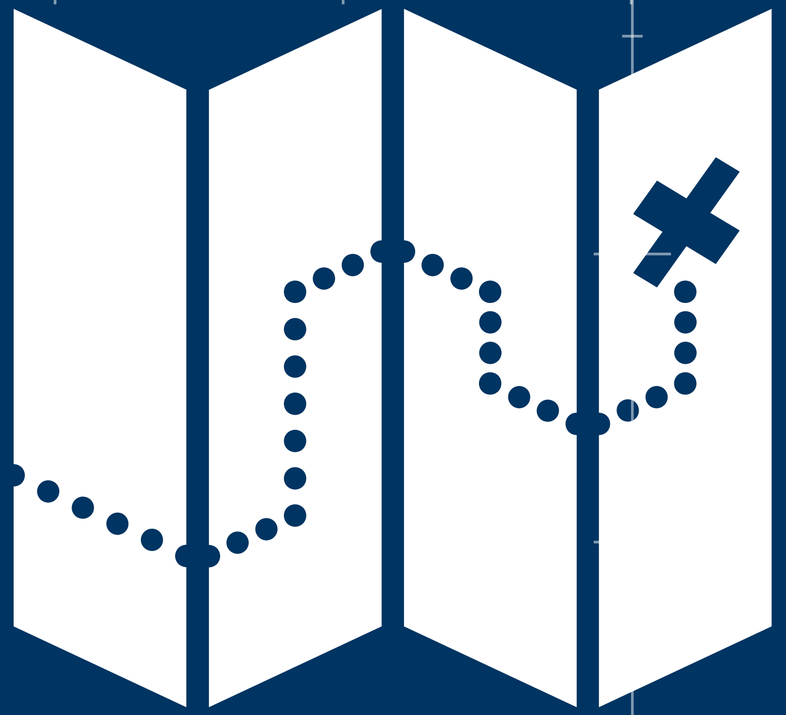
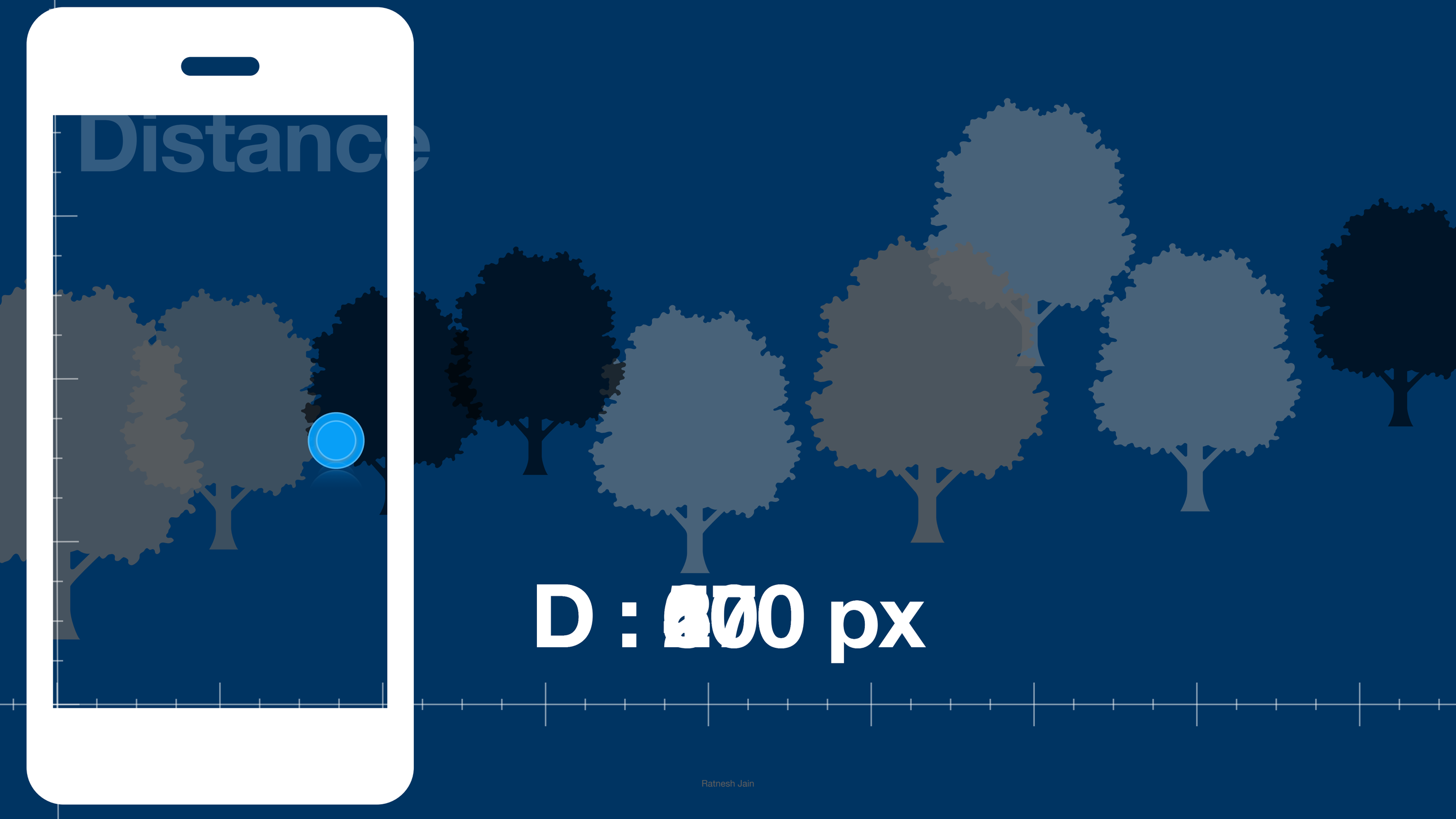
Distance

$$d = P_2 - P_1$$

$p_2 =$ New location

$p_1 =$ Old location




Distance
D : 200 px

Today

- Necessity of ScrollView
- Why UIScrollView now?
  - In the time of SwiftUI
- Coordinates
  - Cartesian
- Physics
  - FoR, Time, Distance, Velocity, Acceleration
- Some Code
  - ScrollView

Velocity

$$v = \frac{distance}{time}$$

$$v = \frac{\Delta d}{\Delta t}$$

Velocity

$$v = \frac{distance}{time}$$

$$v = \frac{\Delta d}{\Delta t} = \frac{670px}{5s}$$

Velocity

$$v = \frac{distance}{time}$$

$$v = \frac{\Delta d}{\Delta t}$$

$$v \,.\, \Delta t = \Delta d$$

Velocity

$$v = \frac{distance}{time}$$

$$v = \frac{\Delta d}{\Delta t}$$

$$\Delta d = v \,.\, \Delta t$$

Today

- **Coordinates**
  - Cartesian
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Acceleration

$$a = \frac{velocity}{time}$$

$$a = \frac{\Delta v}{\Delta t}$$

Acceleration

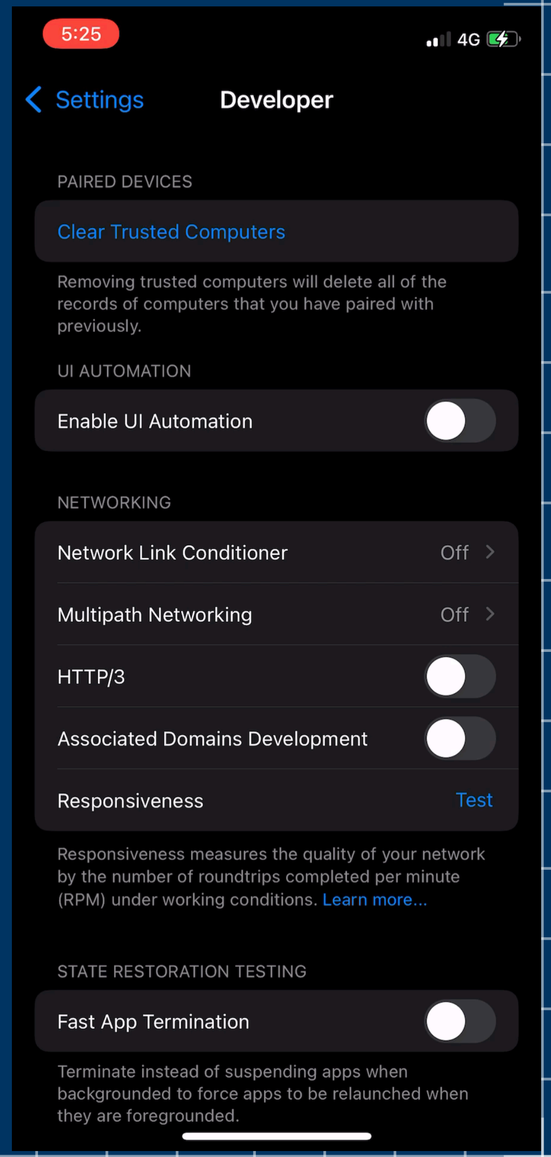
$$a = \frac{velocity}{time}$$

$$a = \frac{\Delta v}{\Delta t}$$

Acceleration

$$acceleration = + \frac{\Delta v}{\Delta t}$$

$$deceleration = - \frac{\Delta v}{\Delta t}$$



Acceleration

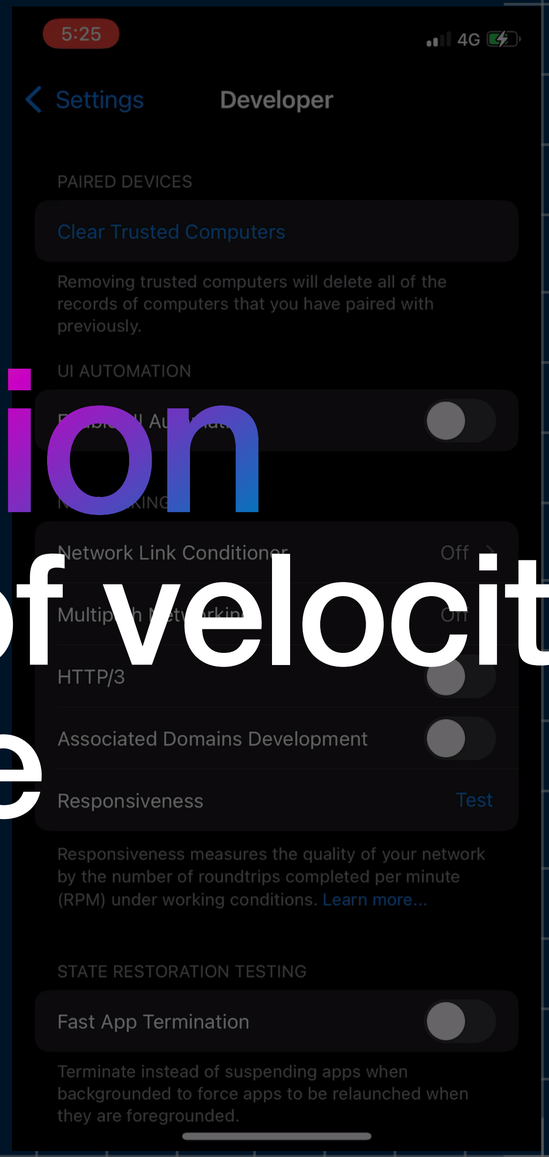
$$acceleration = \frac{\Delta v}{\Delta t}$$

$$deceleration = -\frac{\Delta v}{\Delta t}$$

Acceleration

Positive change of velocity

Over time



Acceleration

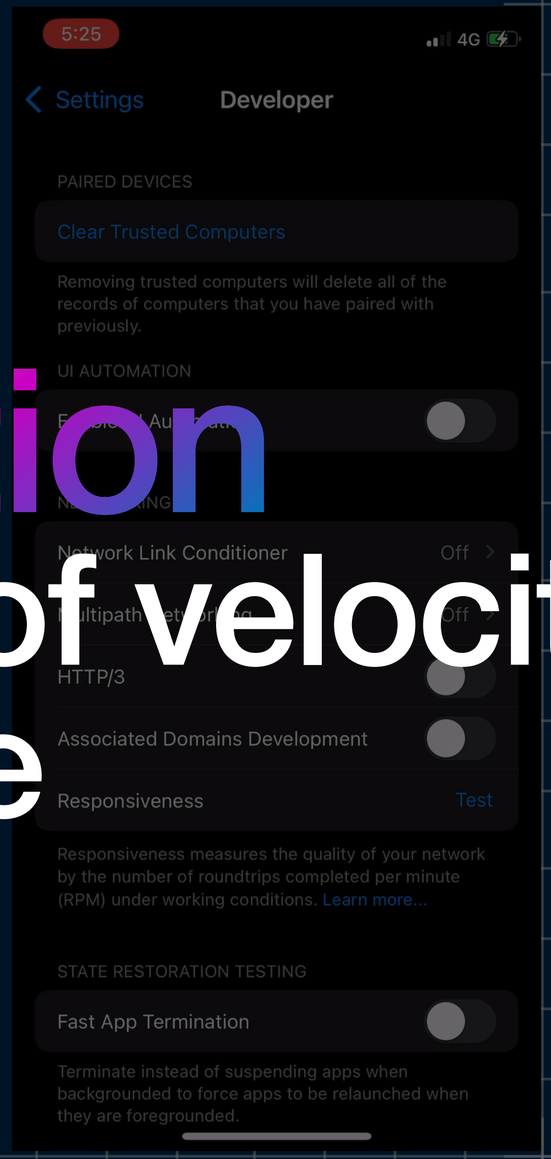
$$acceleration = \frac{\Delta v}{\Delta t}$$

Deceleration

Negative change of velocity

Over time

$$deceleration = -\frac{\Delta v}{\Delta t}$$



Acceleration

$$acceleration = \frac{\Delta v}{\Delta t}$$

$$deceleration = -\frac{\Delta v}{\Delta t}$$

Deceleration

Velocity is decreasing over time

Acceleration

$$acceleration = + \frac{\Delta v}{\Delta t}$$

$$deceleration = - \frac{\Delta v}{\Delta t}$$

Acceleration

$$deceleration = -\frac{\Delta v}{\Delta t}$$

Acceleration

$$decelerationRate = \frac{\Delta v}{\Delta t}$$

$$\Delta t = 1 \text{ Frame}$$

Acceleration

$$decelerationRate = \frac{\Delta v}{\Delta t}$$

$$\Delta t = 1 \text{ Frame}$$

$$decelerationRate = \Delta v$$

Acceleration

$$decelerationRate = \Delta v$$

$$decelerationRate = 0.95$$

$$v2 = v1 \times decelerationRate$$

Acceleration

$$decelerationRate = 0.95$$

$$v2 = v1 \times decelerationRate$$

Start velocity	Calculation	New velocity
100	100 x 0.95	95
95	95 x 0.95	90.25
90.25	90 x 0.95	85.7375
85.7375	85.7375 x 0.95	81.45

Acceleration

$$decelerationRate = 0.95$$

$$v2 = v1 \times decelerationRate$$

Deceleration

Velocity is decreasing over time by 5%

Start velocity	Calculation	New velocity
100	100 x 0.95	95
95	95 x 0.95	90.25
90.25	90 x 0.95	85.7375
85.7375	85.7375 x 0.95	81.45

Today

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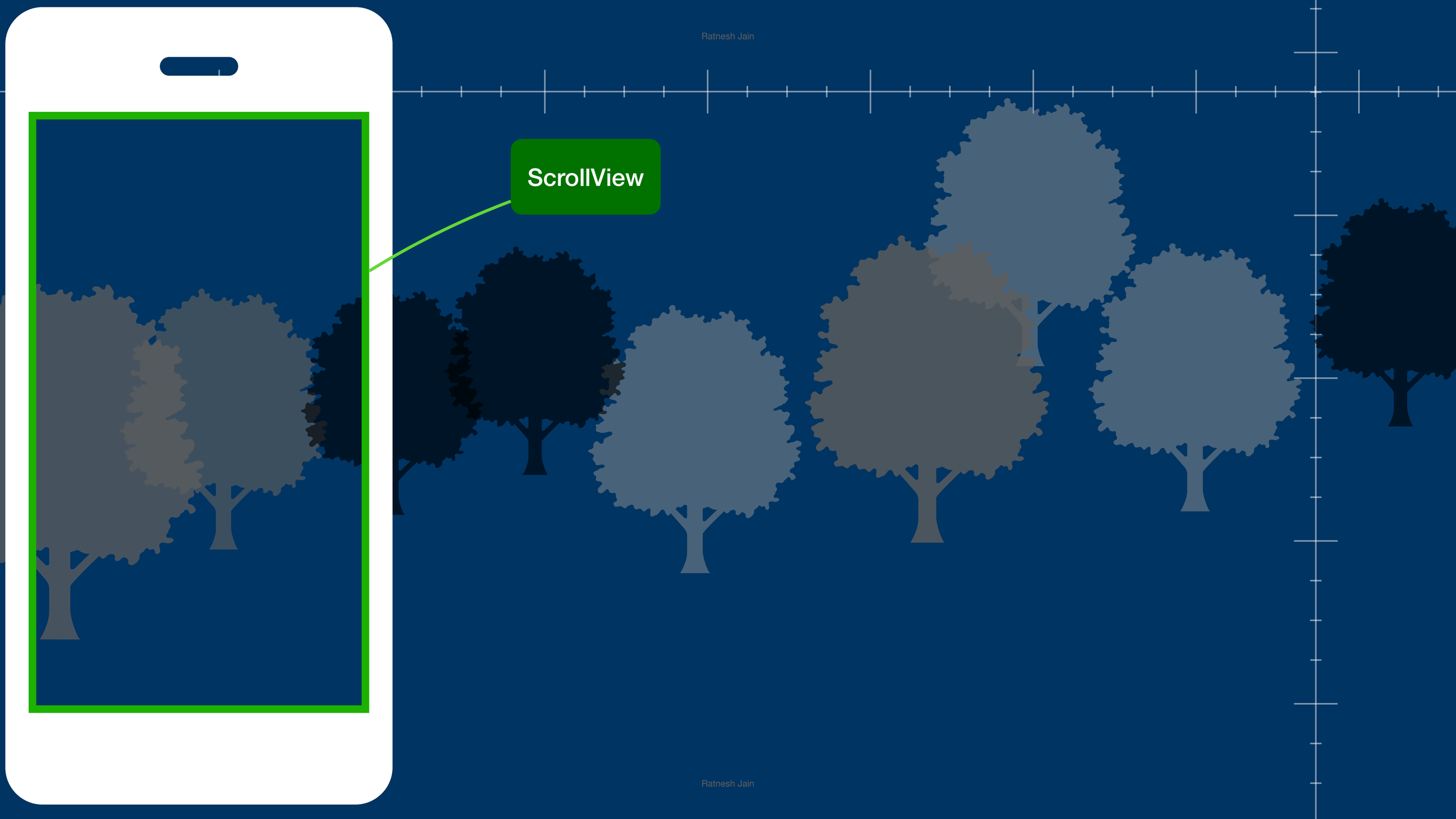
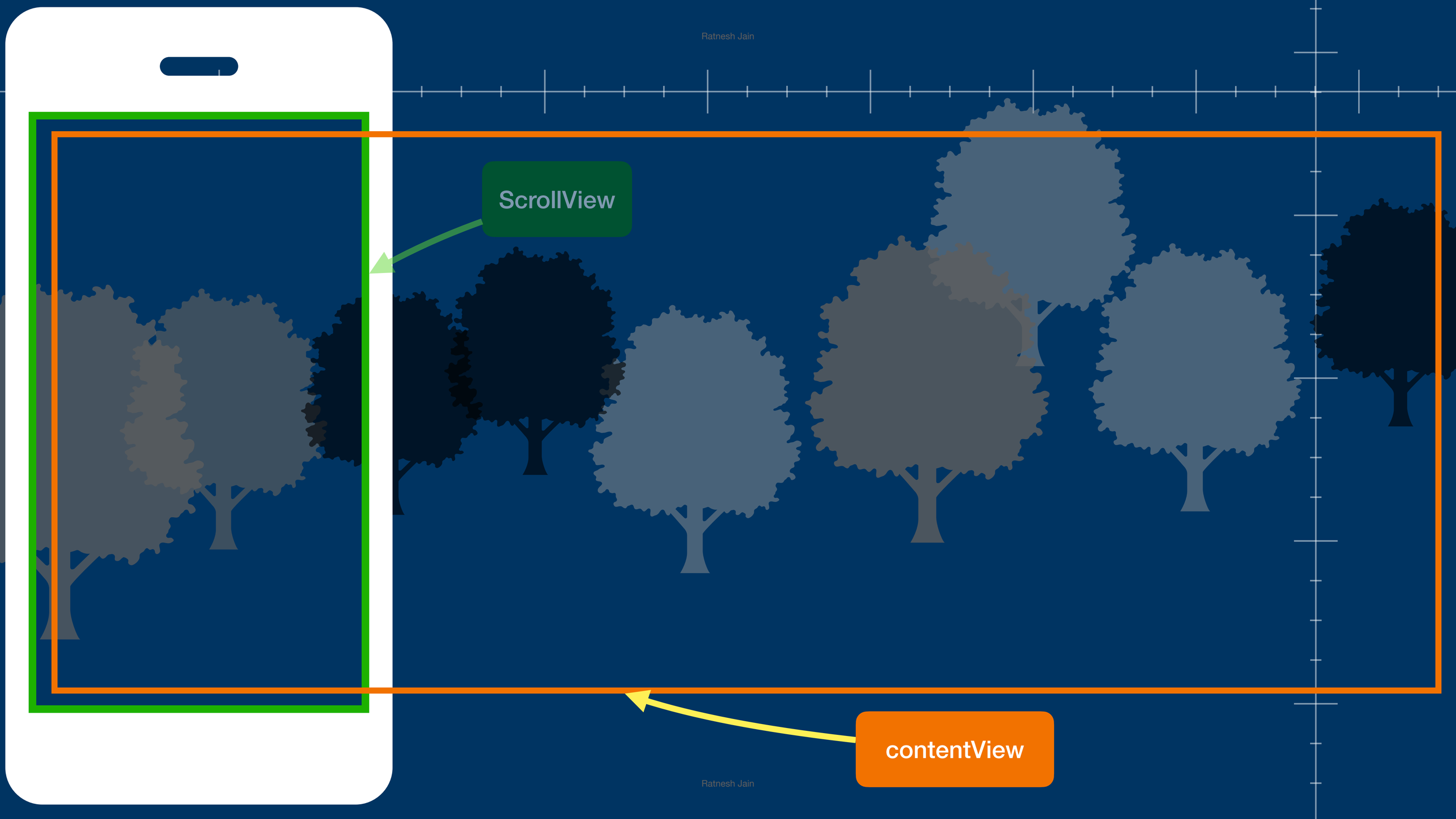
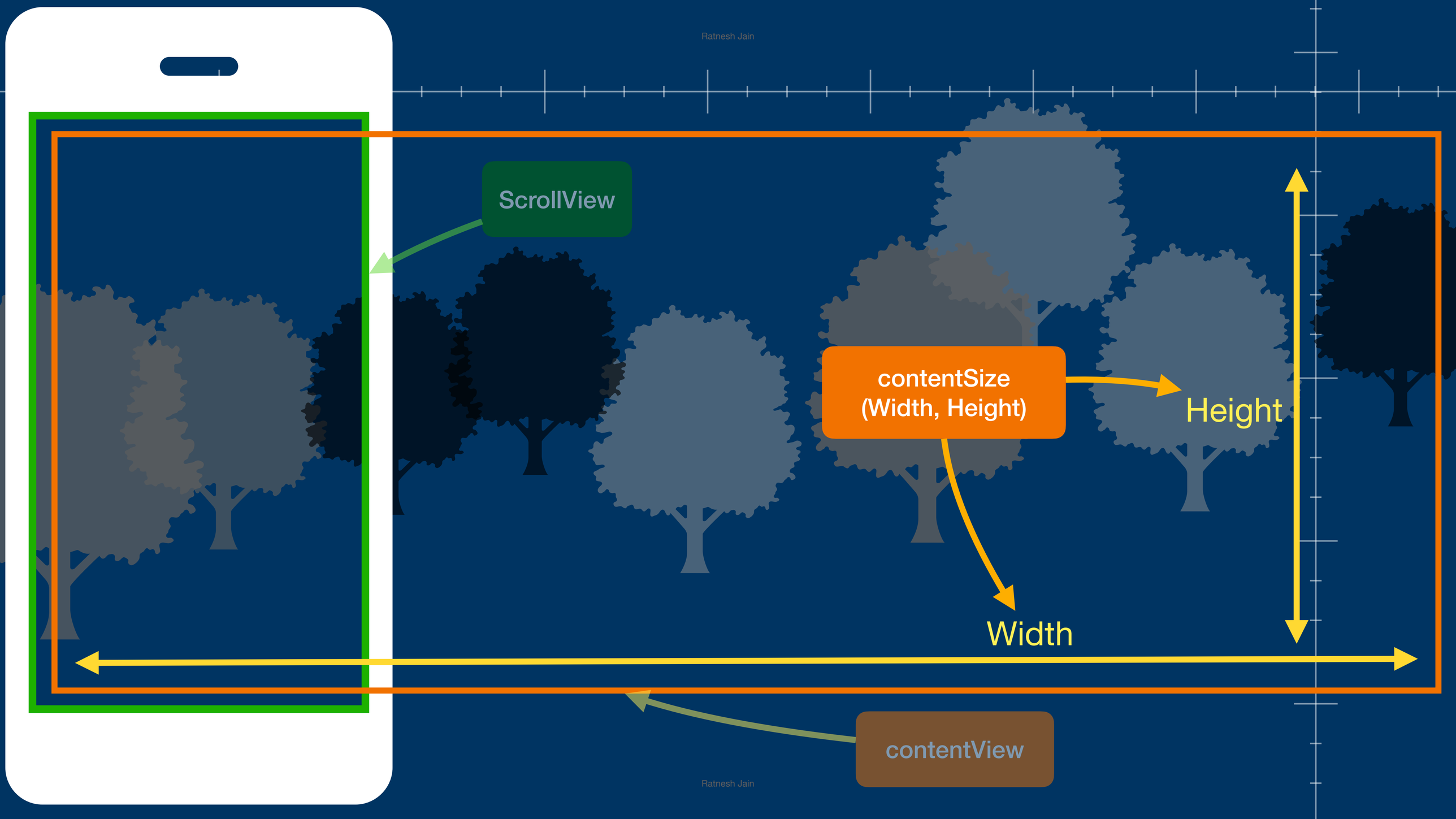
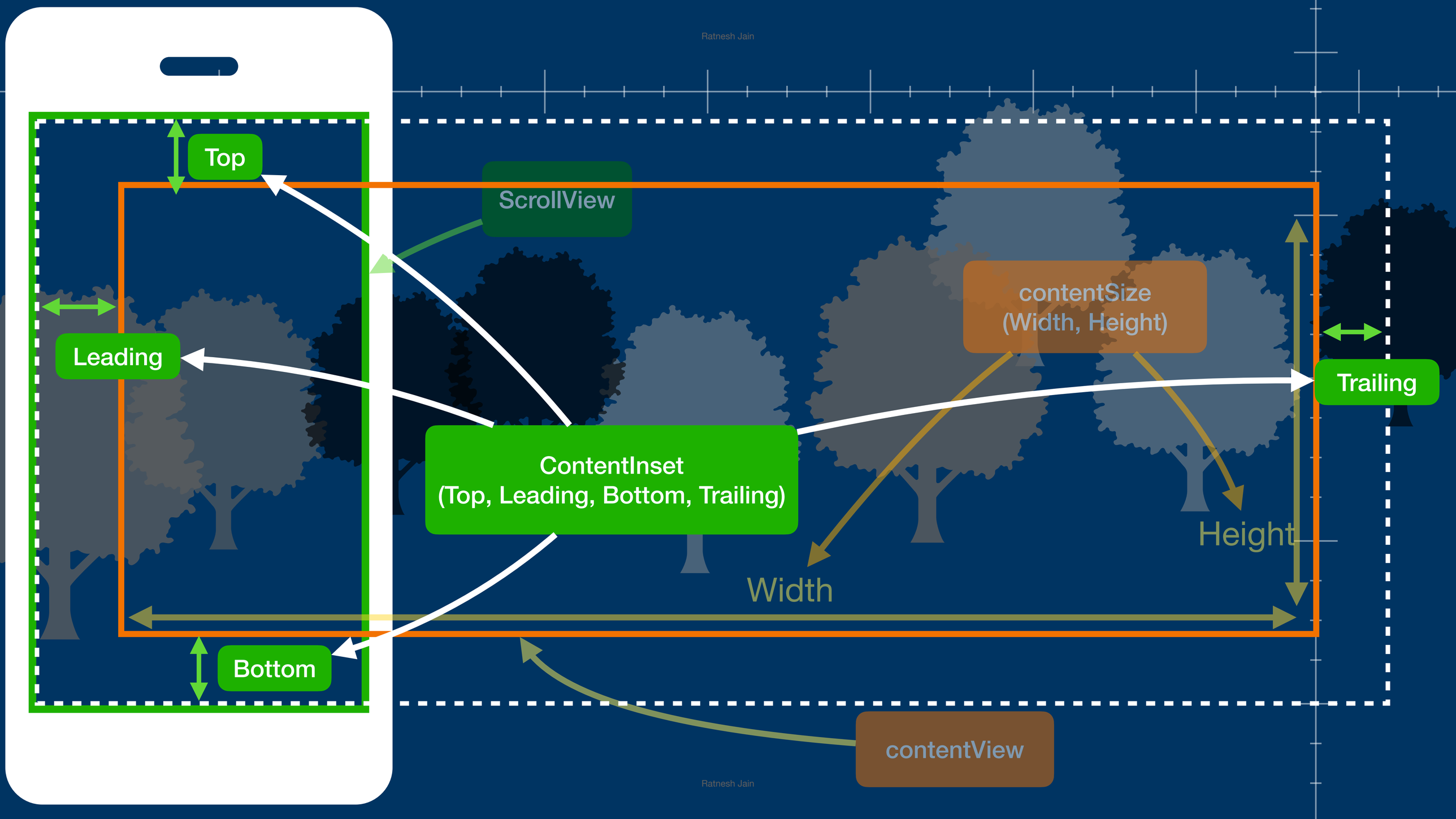
Scroll View Vocabulary









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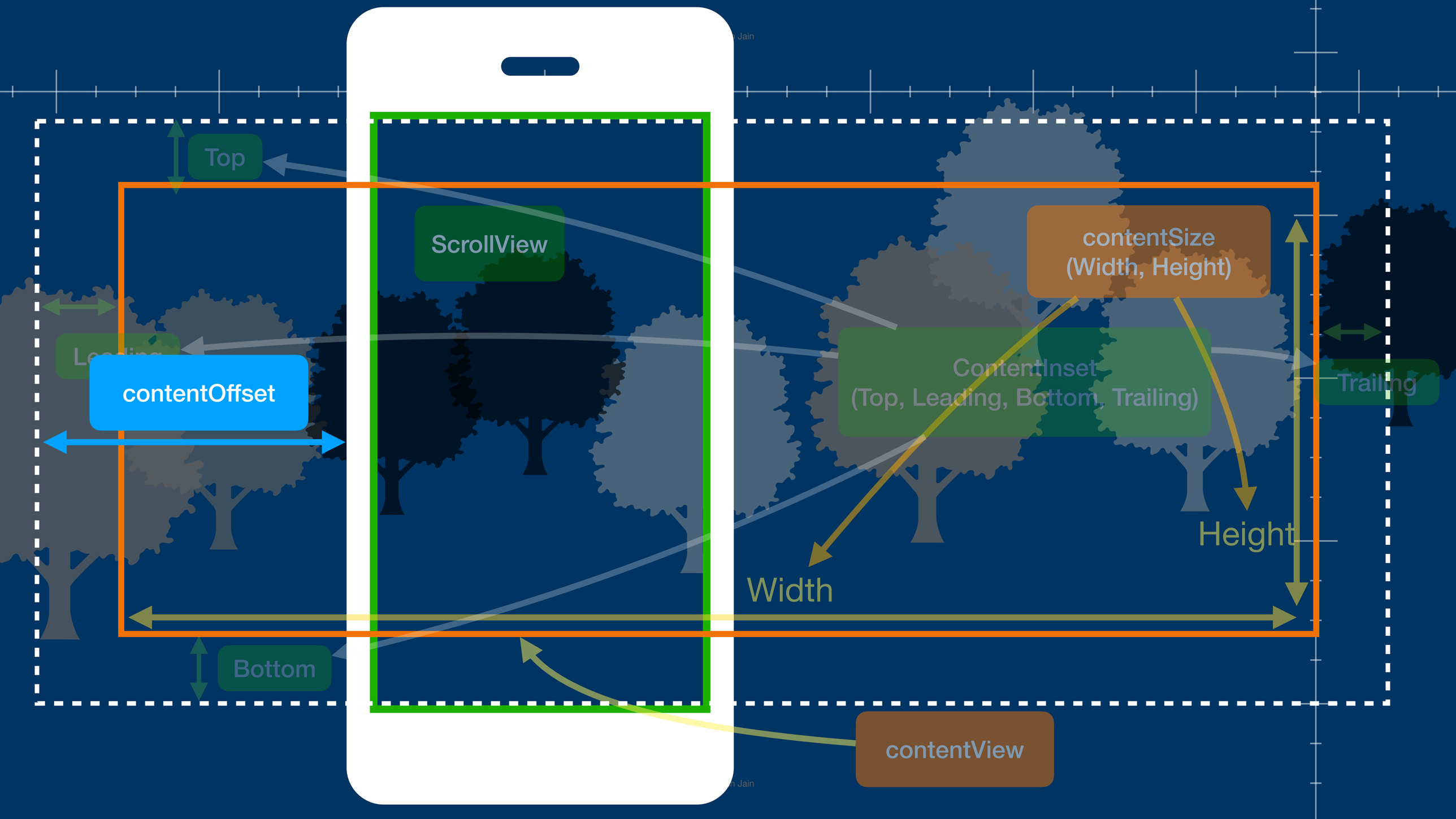
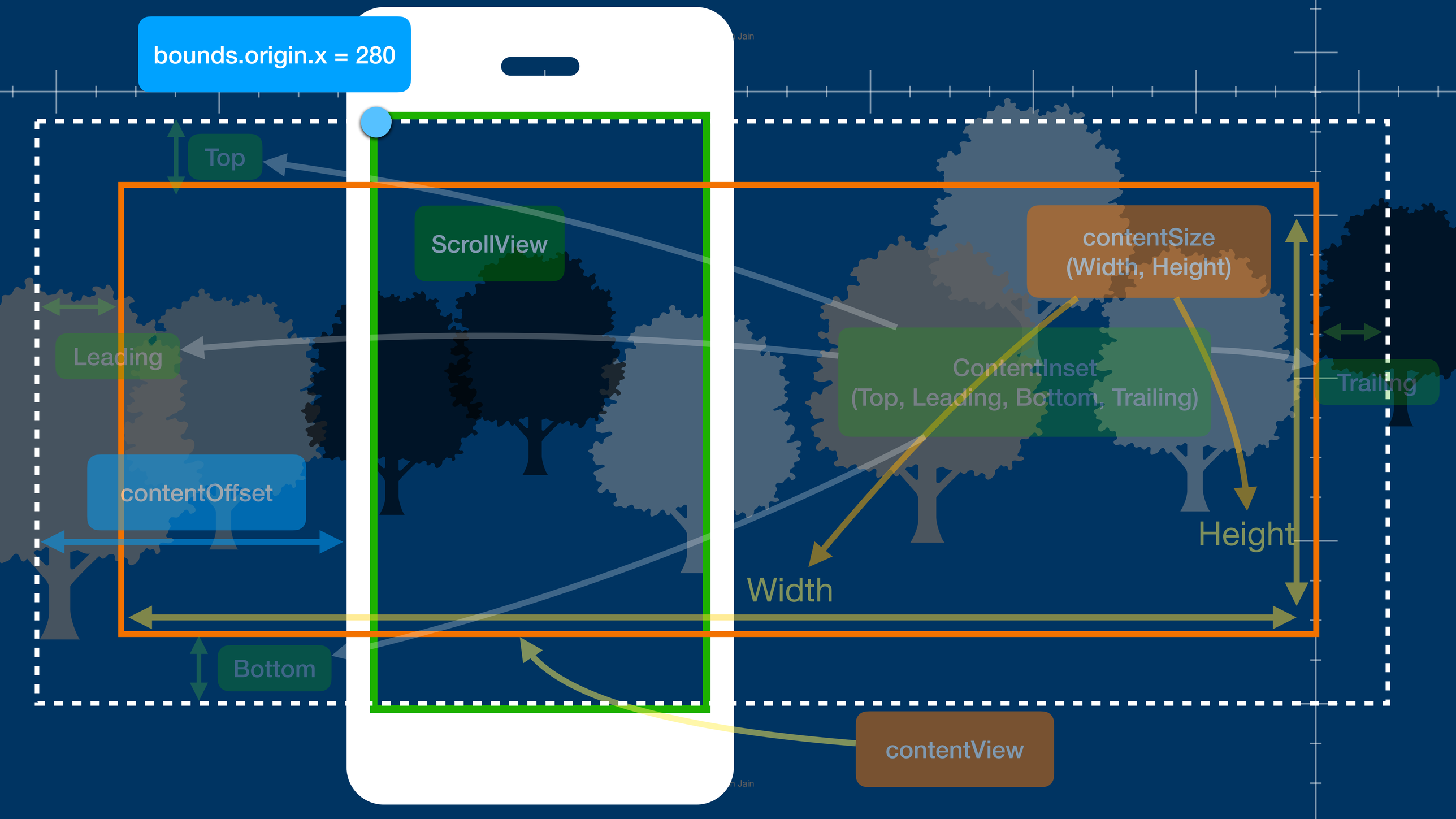

Top
ScrollView
contentSize
(Width, Height)
contentOffset
ContentInset
(Top, Leading, Bottom, Trailing)
Trailing
Height
Width
Bottom
contentView


bounds.origin.x = 280
Top
ScrollView
contentSize
(Width, Height)
Leading
ContentInset
(Top, Leading, Bottom, Trailing)
Trailing
contentOffset
Height
Width
Bottom
contentView

ScrollView Vocabulary

- ScrollView (ViewPort)
- contentView
- contentSize
- contentInset
- contentOffset

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Some Code

- Create a ScrollView from Zero
- Deceleration.

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References

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  - https://www.objc.io/issues/3-views/scroll-view/
- **Understanding ScrollView by Ole Begemann**
  - https://oleb.net/blog/2014/04/understanding-uiscrollview/

Thank you