- в мобильной разработке > 6 лет
- люблю делать красивые анимации
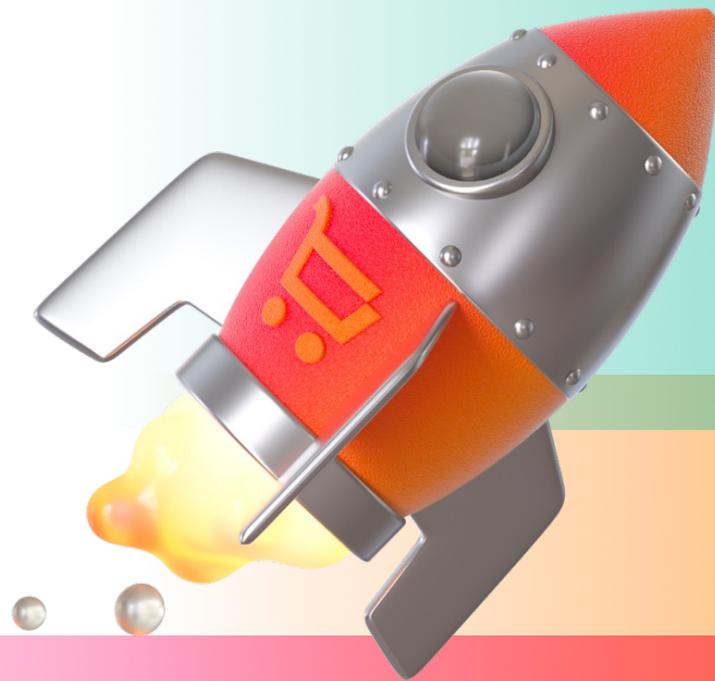
@PROKOPIEVEVGENI

Евгений Прокопьев
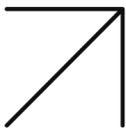
Мобильный разработчик в СберМаркете

🛒 tech

содержание

🛒 tech

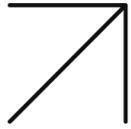В чем вообще проблема

??? 🤷

Надо сделать так
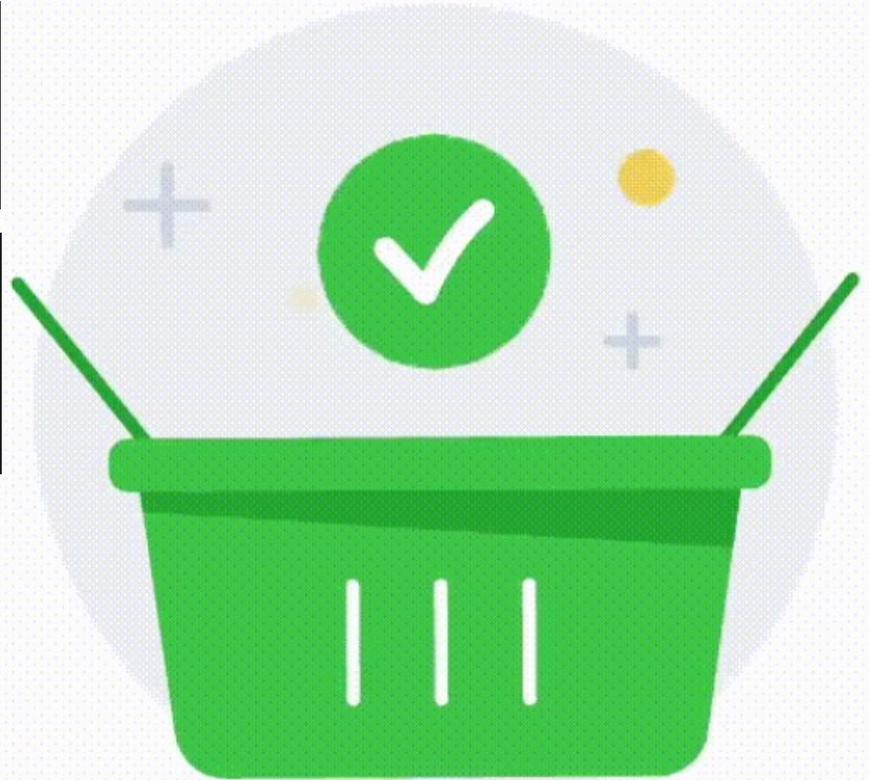
Trash vs Hard coding vs Lottie
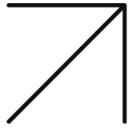
1.gif
GIF image - 28 MB

1.mp4
MPEG-4 movie - 2,1 MB

tech

Trash vs <mark>Hard coding</mark> vs Lottie

tech

Trash vs Hard coding vs Lottie

```
{"v":"5.10.2","fr":60,"ip":0,"op":1380,"w":328,"h":412,"nm":"Comp 3","ddd":0,"assets":
[{"id":"comp_0","nm":"woman 2.2","fr":60,"layers":[{"ddd":0,"ind":2,"ty":4,"nm":"telezhka
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{"a":0,"k":[795,1329,0],"ix":2,"l":2},"a":{"a":0,"k":[545.5,307.5,0],"ix":1,"l":2},"s":
{"a":0,"k":[100,100,100],"ix":6,"l":2}},"ao":0,"shapes":[{"ty":"gr","it":
[{"ind":0,"ty":"sh","ix":1,"ks":{"a":0,"k":{"i":[[0,0],[0,0],[0,0],[0,0]],"o":[[0,0],
[0,0],[0,0],[0,0]],"v":[[-381.718,5.31],[381.751,-1.792],[381.718,-5.31],
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Group","hd":false},{"ty":"fl","c":{"a":0,"k":[1,1,1,1],"ix":4},"o":
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Fill","hd":false},{"ty":"tr","p":{"a":0,"k":[615.702,408.306],"ix":2},"a":{"a":0,"k":
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{"a":0,"k":100,"ix":7},"sk":{"a":0,"k":0,"ix":4},"sa":
{"a":0,"k":0,"ix":5},"nm":"Transform"}],"nm":"Group
1","np":2,"cix":2,"bm":0,"ix":1,"mn":"ADBE Vector Group","hd":false},{"ty":"gr","it":
[{"ind":0,"ty":"sh","ix":1,"ks":{"a":0,"k":{"i":[[0,0],[0,0],[0,0],[0,0]],"o":[[0,0],
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[-381.751,1.792]],"c":true},"ix":2},"nm":"Path 1","mn":"ADBE Vector Shape -
Group","hd":false},{"ty":"fl","c":{"a":0,"k":[1,1,1,1],"ix":4},"o":
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Fill","hd":false},{"ty":"tr","p":{"a":0,"k":[561.152,302.757],"ix":2},"a":{"a":0,"k":
[0,0],"ix":1},"s":{"a":0,"k":[100,100],"ix":3},"r":{"a":0,"k":0,"ix":6},"o":
{"a":0,"k":100,"ix":7},"sk":{"a":0,"k":0,"ix":4},"sa":
{"a":0,"k":0,"ix":5},"nm":"Transform"}],"nm":"Group
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[{"ind":0,"ty":"sh","ix":1,"ks":{"a":0,"k":{"i":[[0,0],[0,0],[0,0],[0,0]],"o":[[0,0],
[0,0],[0,0],[0,0]],"v":[[-401.069,5.326],[401.101,-1.808],[401.069,-5.326],
[-401.101,1.808]],"c":true},"ix":2},"nm":"Path 1","mn":"ADBE Vector Shape -
Group","hd":false},{"ty":"fl","c":{"a":0,"k":[1,1,1,1],"ix":4},"o":
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Fill","hd":false},{"ty":"tr","p":{"a":0,"k":[524.212,197.193],"ix":2},"a":{"a":0,"k":
[0,0],"ix":1},"s":{"a":0,"k":[100,100],"ix":3},"r":{"a":0,"k":0,"ix":6},"o":
{"a":0,"k":100,"ix":7},"sk":{"a":0,"k":0,"ix":4},"sa":
{"a":0,"k":0,"ix":5},"nm":"Transform"}],"nm":"Group
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[{"ind":0,"ty":"sh","ix":1,"ks":{"a":0,"k":{"i":[[0,0],[0,0],[0,0],[0,0]],"o":[[0,0],
[0,0],[0,0],[0,0]],"v":[[-110.624,-206.761],[107.51,208.397],[110.624,206.761]
```

1.json
JSON Document - 1,8 MB

```
lottie.loadAnimation({
  container: element,
  renderer: 'svg',
  loop: true,
  autoplay: true,
  path: 'data.json'
});
```

tech

Кто слышал о Lottie ??? ✋

Lightweight, scalable animations for your **websites** and **apps**

LottieFiles takes away the complexity from motion design. It lets you create, edit, test, collaborate and ship a Lottie in the easiest way possible.

Go to Dashboard

🛒 tech
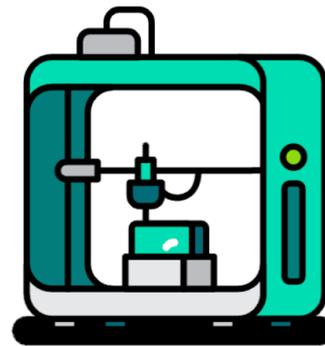
Hernan Torrisi

Создатель Lottie, сейчас работает над Rive.app

2015: создал плагин - Bodymovin для экспорта анимаций из After Effects и первую версию плеера

2017: релизнули плеер для android и ios

2020: создали новый формат dotLottie

2023: редактор для создания анимаций на базе проекта thorvg

Сколько этапов от создания
до проигрывания анимации

??? ✋

🛒 tech

Пайплайн создания анимаций на Lottie

Lottie pipeline

Ai 🎨 ◆ Design → Ae Animate → B Export → Run

| Illustrator, Figma, or Sketch | After Effects | BodyMovin (json) | Lottie |

🛒 tech
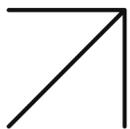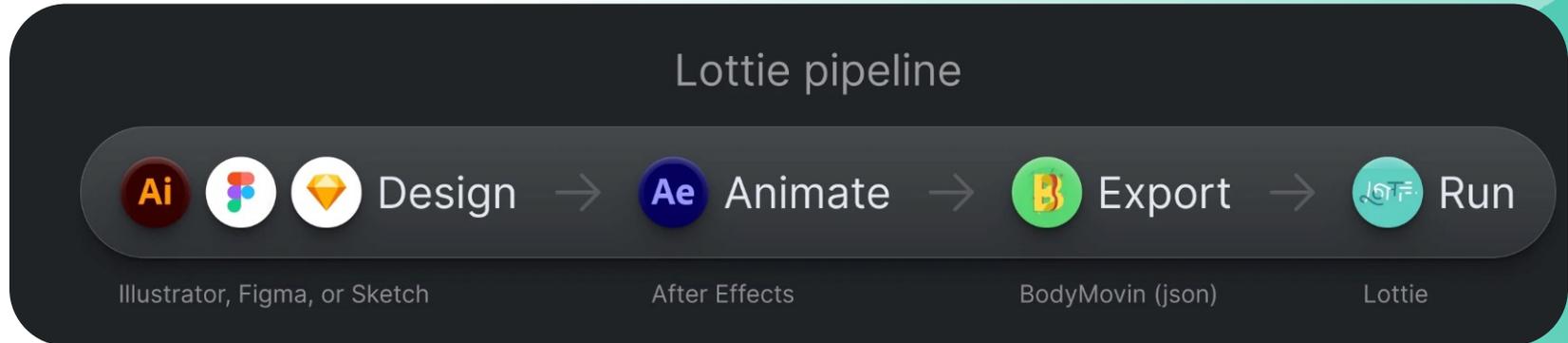
Плагин для AE
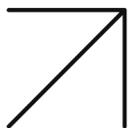
Список свойств

Lottie Supported Features

Lottie does not support all features of Adobe After Effects; please refer to the list below for details.
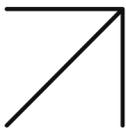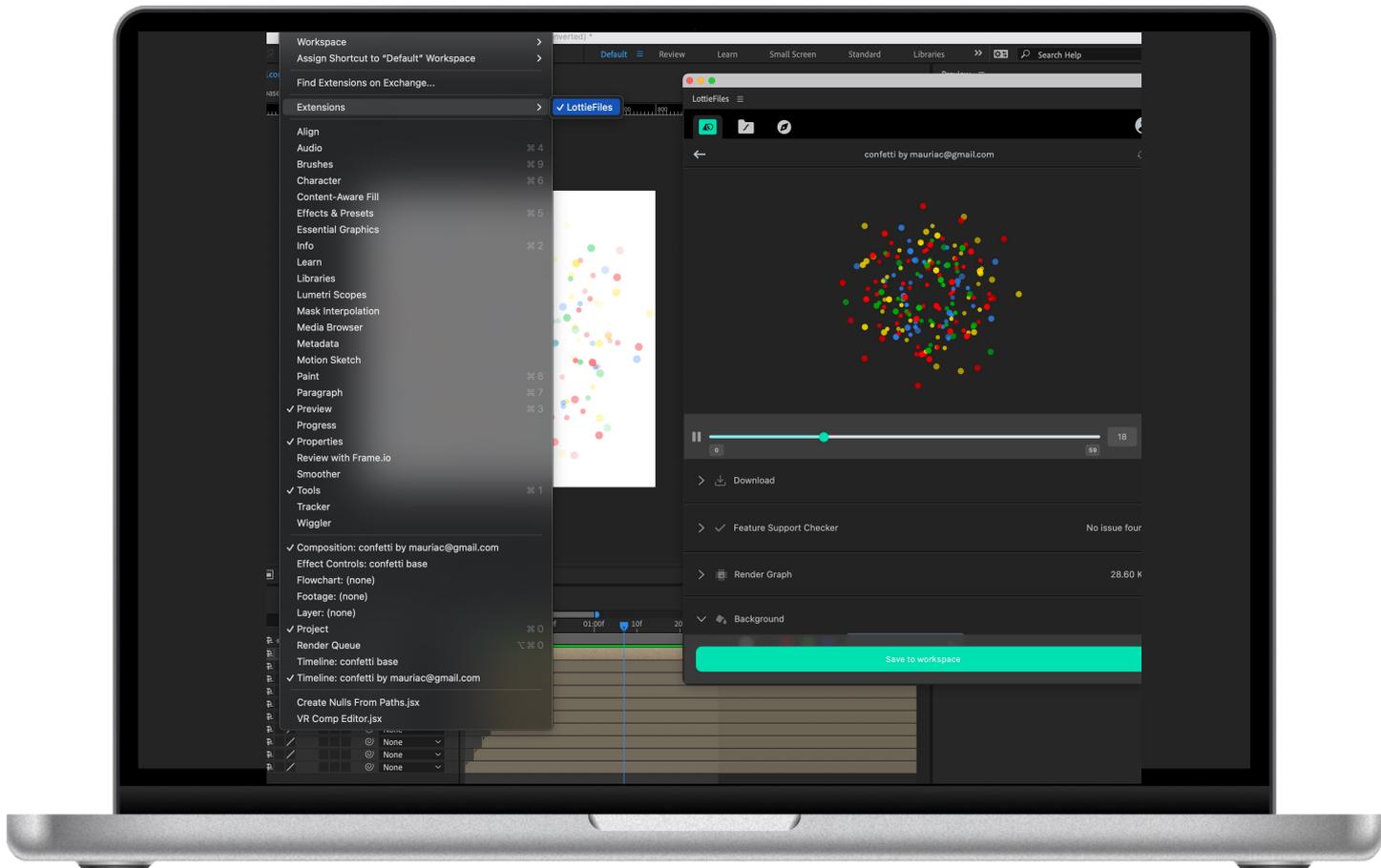To test your animations with web, iOS & Android players, please use LottieFiles online preview, desktop and mobile apps.

Shapes	Android	iOS	Windows	Web (SVG)	Web (Canvas)	Web (HTML)
Shape	👍	👍	👍	👍	👍	👍
Ellipse	👍	👍	👍	👍	👍	👍
Rectangle	👍	👍	👍	👍	👍	👍
Rounded Rectangle	👍	👍	👍	👍	👍	👍
Polystar	👍	👍	⛔	👍	👍	👍
Group	👍	👍	👍	👍	👍	👍
Repeater	👍	⛔	👍	👍	👍	👍
Trim Path (individually)	👍	👍	⛔	👍	👍	👍
Trim Path (simultaneously)	👍	👍	👍	👍	👍	👍

tech
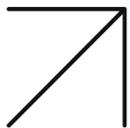
На выходе JSON, внутри инструкции

```json
{ Animation
    "v": "5.7.1",
    "ip": 0,
    "op": 180,
    "nm": "Animation",
    "fr": 60,
    "w": 512,
    "h": 512,
    "layers": [
        { Shape Layer
            "ddd": 0,
            "ty": 4,
            "ind": 0,
            "st": 0,
            "ip": 0,
            "op": 180,
            "nm": "Layer",
            "ks": { Transform
                "a": { Animated Position
                    "a": 0,
                    "k": [
                        256,
                        256
                    ]
                },
                "p": { Animated Position
                    "a": 0,
                    "k": [
                        256,
                        256
                    ]
                },
                "s": { Animated Vector
                    "a": 0,
```
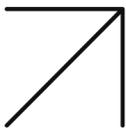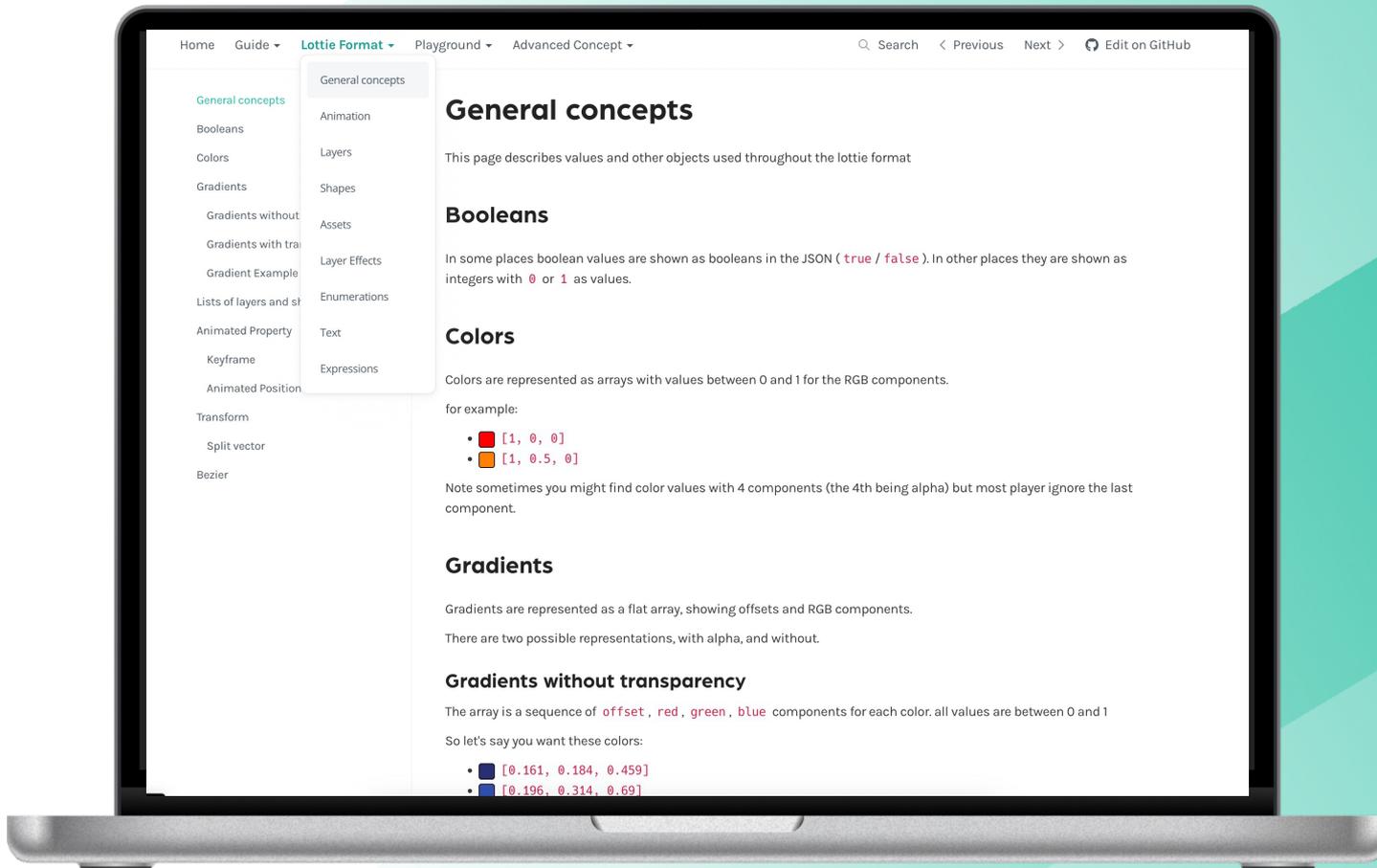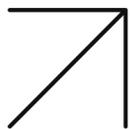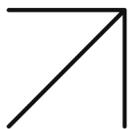
Внутри инструкции

Hernan про работу над плеером

«Specifically talking about Lottie on the web, the player file size is pretty large, and it's a lot of JavaScript. It's like trying to have After Effects in 60 kilobytes of JavaScript»

(Hernan)

tech

Загрузка из asset

```swift
if
  let animationCache = animationCache,
  let animation = animationCache.animation(forKey: cacheKey)
{
  /// If found, return the animation.
  return animation
}

do {
  /// Load jsonData from Asset
  let json = try Data(assetName: name, in: bundle)
  /// Decode animation.
  let animation = try LottieAnimation.from(data: json)
  animationCache?.setAnimation(animation, forKey: cacheKey)
  return animation
} catch {
```
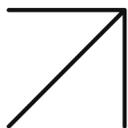
Чтение инструкций

```swift
startFrame = try dictionary.value(for: CodingKeys.startFrame)
endFrame = try dictionary.value(for: CodingKeys.endFrame)
framerate = try dictionary.value(for: CodingKeys.framerate)
width = try dictionary.value(for: CodingKeys.width)
height = try dictionary.value(for: CodingKeys.height)
let layerDictionaries: [[String: Any]] = try dictionary.value(for: CodingKeys.layers)
layers = try [LayerModel].fromDictionaries(layerDictionaries)
if let glyphDictionaries = dictionary[CodingKeys.glyphs.rawValue] as? [[String: Any]] {
  glyphs = try glyphDictionaries.map { try Glyph(dictionary: $0) }
} else {
  glyphs = nil
}
if let fontsDictionary = dictionary[CodingKeys.fonts.rawValue] as? [String: Any] {
  fonts = try FontList(dictionary: fontsDictionary)
} else {
  fonts = nil
}
```

```swift
enum CodingKeys: String, CodingKey {
  case version = "v"
  case type = "ddd"
  case startFrame = "ip"
  case endFrame = "op"
  case framerate = "fr"
  case width = "w"
  case height = "h"
  case layers
  case glyphs = "chars"
  case fonts
  case assetLibrary = "assets"
  case markers
}
```
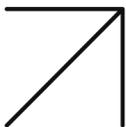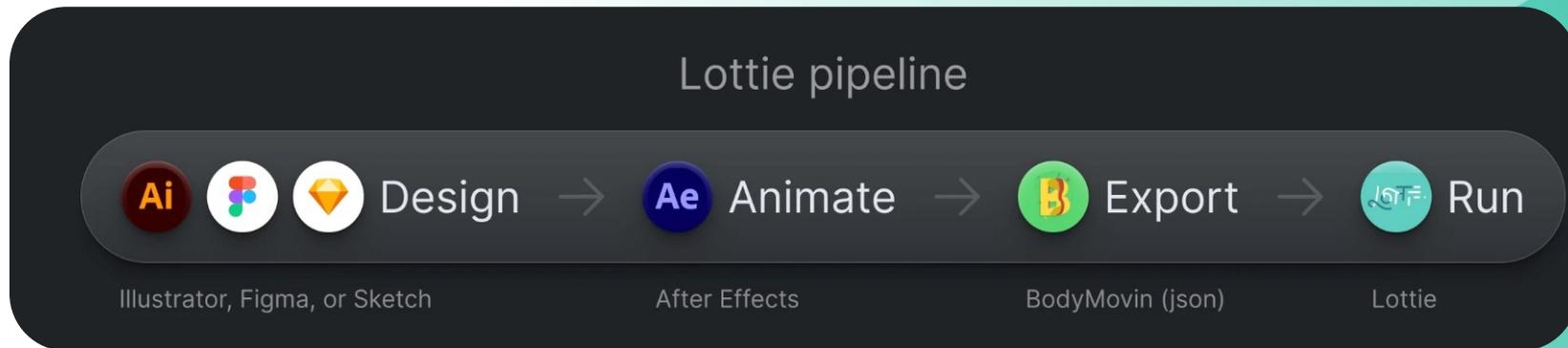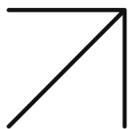
Рисование

```swift
for layer in layers.reversed() {
  layer.bounds = bounds
  animationLayers.append(layer)
  if let imageLayer = layer as? ImageCompositionLayer {
    imageLayers.append(imageLayer)
  }
  if let textLayer = layer as? TextCompositionLayer {
    textLayers.append(textLayer)
  }
  if let matte = mattedLayer {
    /// The previous layer requires this layer to be its matte
    matte.matteLayer = layer
    mattedLayer = nil
    continue
  }
  if
    let matte = layer.matteType,
    matte == .add || matte == .invert
  {
    /// We have a layer that requires a matte.
    mattedLayer = layer
  }
  addSublayer(layer)
}
```

```swift
layerImageProvider.addImageLayers(imageLayers)
layerImageProvider.reloadImages()
layerTextProvider.addTextLayers(textLayers)
layerTextProvider.reloadTexts()
layerFontProvider.addTextLayers(textLayers)
layerFontProvider.reloadTexts()
```
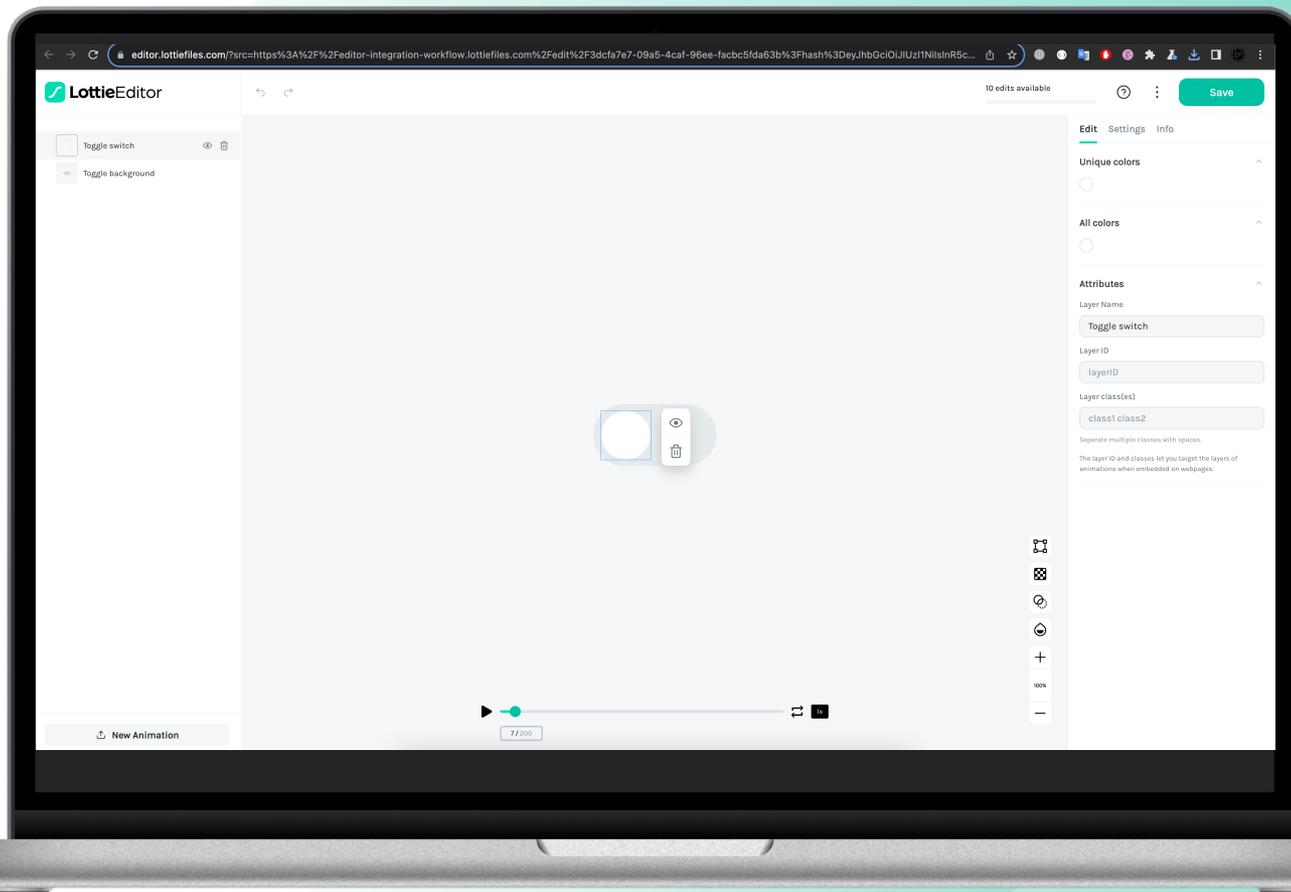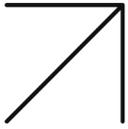
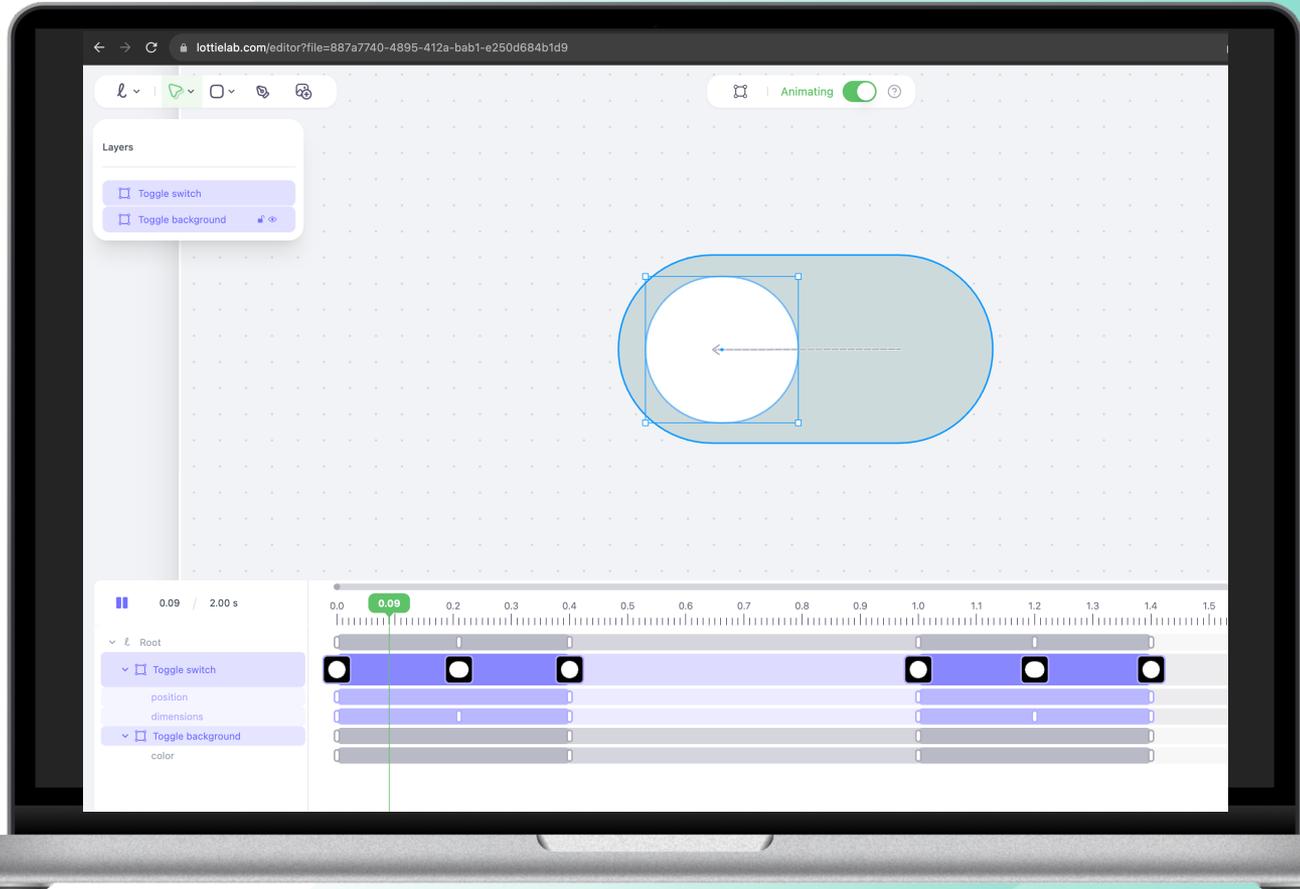tech

Пайплайн создания анимаций на Lottie

Lottie pipeline

Ai 🎨 ◆ Design	→	Ae Animate	→	B Export	→	Run
Illustrator, Figma, or Sketch		After Effects		BodyMovin (json)		Lottie

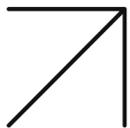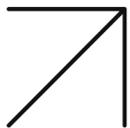🛒 tech
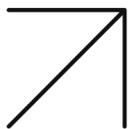
editor.lottiefiles.com

Саммари: Lottie

- Нет единого механизмы для создания анимаций

tech

Саммари: Lottie

- Нет единого механизмы для создания анимаций

- Тем более для воспроизведения

tech
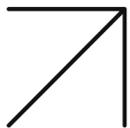
Саммари: Lottie

- Нет единого механизмы для создания анимаций

- Тем более для воспроизведения

- Нельзя в рантайме влиять на анимации

tech

Саммари: Lottie

- Нет единого механизм[а]

- Тем[б...]

- [...] на анимации

Отличный инструмент для воспроизведения анимаций

!!!

🛒 tech

Но!! Новая фича...

!?!

tech

Фича

tech
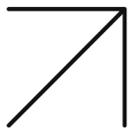
Как реализовать такое ???

✋

🛒 tech
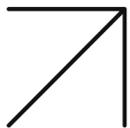
Дежавю

Trash vs ==Hard coding== vs Lottie

🛒 tech

Rive, welcome

Поверим, что дальше?

animation.riv   ✕

 1   5249 5645 0700 cf14 a001 0000 0000 0017
 2   0001 0405 5472 7563 6b07 0000 f044 0800
 3   0087 4409 00e0 fcc4 0a00 00fa 4200 0204
 4   0472 6f6f 7405 0010 cdcc 4c3f 11cd cc4c
 5   3f0d d907 8144 0e17 fd46 4400 0204 0574
 6   7275 636b 0501 0002 0502 0d80 83e8 c00e
 7   bc08 9bc3 0002 0404 626f 6479 0503 108f
 8   9488 3f11 2c13 8d3f 0dbc 5c06 430e a9e8
 9   2543 0002 0405 6d6f 746f 7205 0410 deea
10   6f3f 1117 4668 3f00 0304 0573 6861 7065
11   0505 1001 00a0 3f11 0000 a03f 0dba af83
12   c10e afb1 d8c3 0010 0405 0450 6174 6805
13   0620 0100 0505 0718 00ca ea40 1900 d597
14   401a 0090 6941 0005 0507 1820 c94d c219
15   38db 0242 1a00 9069 4100 0505 0718 003f
16   c440 19b0 f73a 421a 0090 6941 0005 0507
17   1860 dc79 4219 e031 9a41 1a00 9069 4100
18   1205 9302 25a1 9a44 ff00 0304 0472 6f6f
19   6605 0510 9094 883f 112c 138d 3f0d 6ebc
20   b0c3 0e5c d387 c300 1004 0d0c 5041 5354
21   4544 3a20 5061 7468 050d 2001 0006 050e
22   18e8 901b c219 8e81 82c1 540c db19 4055
23   d1ee 5941 563d d33c bf57 98f6 e341 0023
24   050e 1893 c688 4319 1c67 25c3 5285 04a4
25   bd53 2bcf 1c42 0006 050e 1844 f1f9 4319

```
RiveViewModel(
  fileName: "animation",
  autoPlay: true
).view().frame(
  width: 200,
  height: 200,
  alignment: .center
)
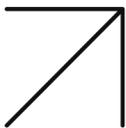```

🛒 tech

# Пробуем и все работает
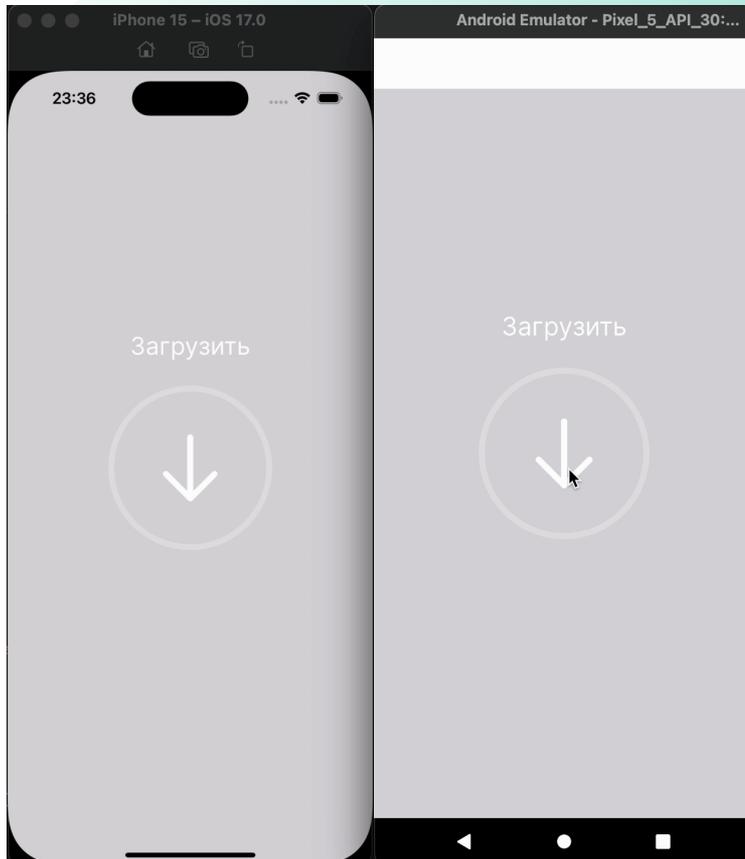
**2014-2016:** Max Wihlborg и Michelle Engvall начали разрабатывать инструмент

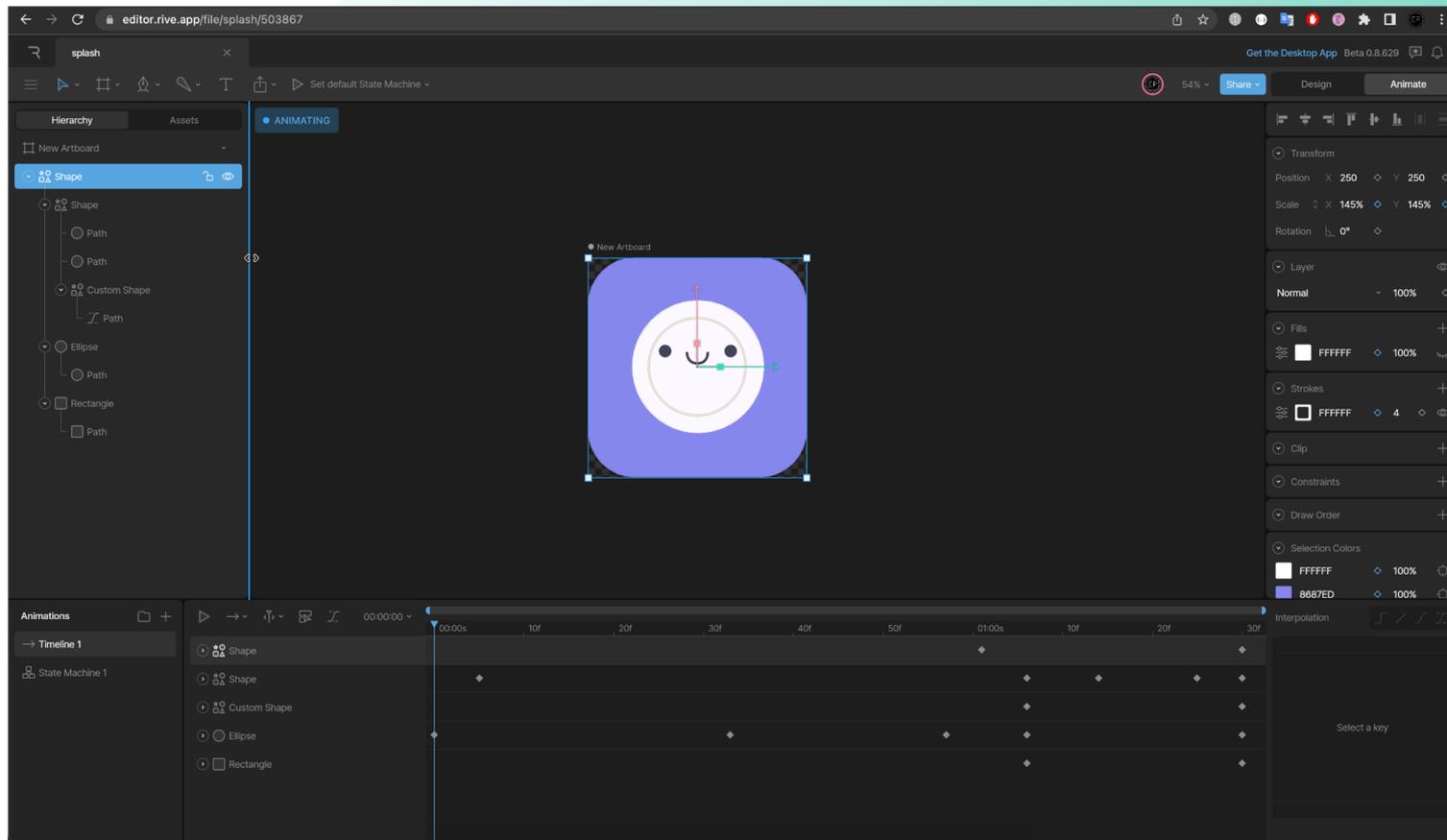**2017:** Запуск Flare, инструмент для создания анимаций и экспорта их в gif или Lottie

**2019:** Flare -> Rive

**2020:** Пошли в кроссплатформу, включая Flutter, Unity, React Native
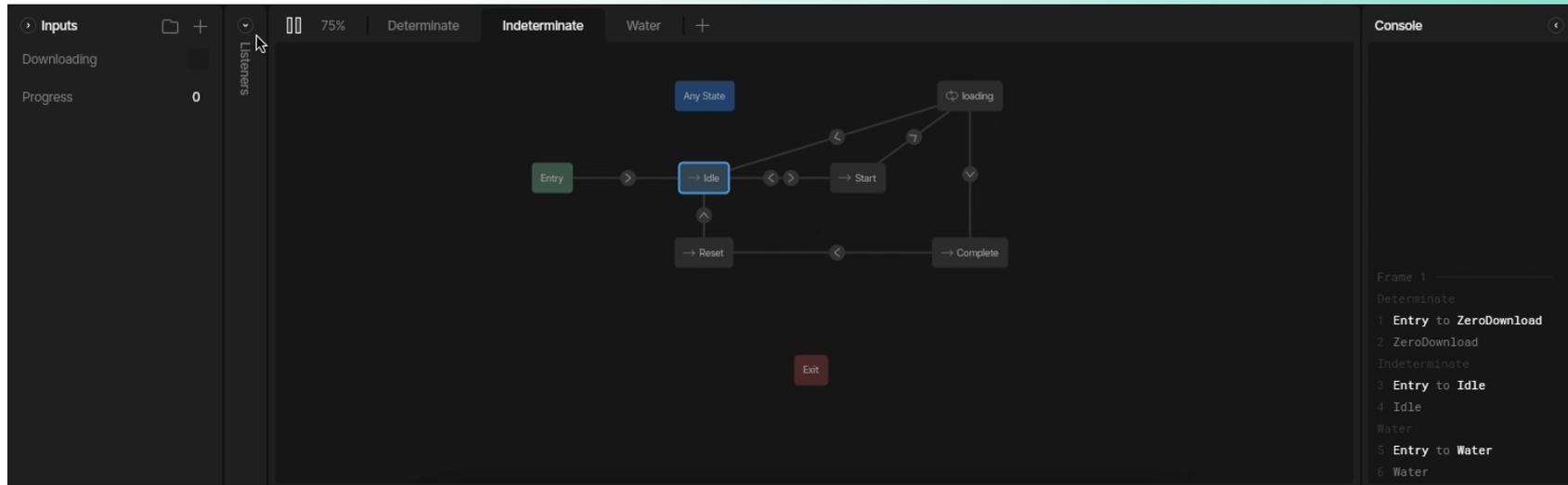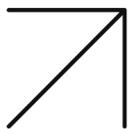
**2021+** Активно внедряют новые фичи

# Полноценный редактор
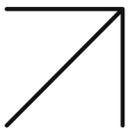
# Машина состояний

# Зависимости извне - boolean

# Зависимости извне - trigger

# Зависимости извне - number

# Внешние переменные

# Создание костей

# Создание костей



tech

# Lottie -> Rive

# Features

.json .riv

animation.riv
52 KB
Last modified on 30 Aug 2023, 9:47:56 AM

tech

animation.riv

1   5249 5645 0700 88ca 20c6 01ec 01ad 01c5
2   0100 0000 0000 1700 0107 0000 fa43 0800
3   00fa 43ec 0100 040c 4e65 7720 4172 7462
4   6f61 7264 0012 0502 2531 3131 ff00 1405
5   0000 1f37 0a54 696d 656c 696e 6520 3100
6   3537 0f53 7461 7465 204d 6163 6869 6e65
7   2031 0039 8a01 074c 6179 6572 2031 003d
8   9501 0000 3f00 4197 0100 0040 003e 0001
9   0417 616e 696d 6174 696f 6e5f 6c6c 786a
10  746b 7a70 2e6a 736f 6e07 0000 fa44 0800
11  00fa 4409 0000 1644 ec01 0000 0204 0448
12  616e 6405 000d 0000 7a44 0e00 007a 4400
13  0205 010d 0000 7ac4 0e00 007a c400 0204
14  0b4d 6964 646c 6520 4c69 6e65 0502 0081
15  4d62 440e 7bc8 9d44 0002 0503 0df8 93bd
16  420e ec21 83c3 0002 0407 5368 6170 6520
17  3105 0400 0204 0954 7261 6e73 666f 726d
18  0505 0002 0506 0003 0406 5061 7468 2031
19  0507 0010 0508 0006 0509 1800 003b c319
20  00c0 cb43 54df cacf bf55 7a5c 8a42 56d0
21  54c2 3f57 0e4a d142 0006 0509 1800 8082
22  c319 0000 ae43 54b8 f9f1 3f55 1163 3643
23  5602 26a0 bf57 7993 1543 0006 0509 1800
24  003b 4319 0000 de42 542f 1145 c055 f03f
25  8043 56de aa7f 3d57 f03f 8043 0012 05ac
26  0125 8200 29ff 0002 0405 5468 756d 6205
27  020d c1ca 1a44 0e00 d092 4400 0205 0e0d
28  7f6a be43 0e00 802e c300 0204 0753 6861
29  7065 2031 050f 0002 0409 5472 616e 7366
30  6f72 6d05 1000 0205 1100 0304 0650 6174
31  6820 3105 1200 1005 1300 0605 1418 0000
32  2cc4 1900 0096 c254 e578 33c0 5564 7606
33  4356 c3b7 ac3e 57e7 000e 4300 0605 1418
34  0000 b0c3 1921 0092 4354 8c91 d7bf 55e0
35  9677 4356 238e ba3f 578e 9d08 4300 0605
36  1418 0080 abc3 1900 00f0 4300 1205 ad01
37  25ff 6043 ff00 0204 0753 6861 7065 2032
38  050f 0002 0409 5472 616e 7366 6f72 6d05
39  1900 0205 1a00 0304 0650 6174 6820 3105
40  1b00 1005 1c00 0605 1d18 0000 2cc4 1900
41  0096 c254 e578 33c0 5564 7606 4356 c3b7
42  ac3e 57e7 000e 4300 0605 1d18 0000 b0c3
43  1921 0092 4354 8c91 d7bf 55e0 9677 4356
44  238e ba3f 578e 9d08 4300 0605 1d18 0080
45  abc3 1900 00f0 4300 1205 ae01 2582 0029
46  ff00 2f05 ae01 730a d763 3f75 0200 0204
47  0d46 606c 6775 2265 207c 4974 726e 0502

# engine

mjtalbot  patch up division by zero issue on nor

Name

..
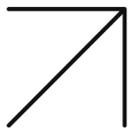
rive-cpp @ a0fca85

rive-ios / submodules /

mjtalbot  patch up division by zero issue on normaliz

Name

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rive-cpp @ a0fca85

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rive-cpp @ a0fca85

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rive-cpp @ a0fca85

🛒 tech
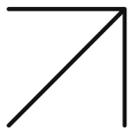
# .riv – binary

```cpp
private:
    static constexpr char fingerprint[] = "RIVE";

for (int i = 0; i < 4; i++) {
    auto b = reader.readByte();
    if (fingerprint[i] != b) {
        return false;
    }
}

header.m_MajorVersion = reader.readVarUintAs<int>();
if (reader.didOverflow()) {
    return false;
}
header.m_MinorVersion = reader.readVarUintAs<int>();
if (reader.didOverflow()) {
    return false;
}

header.m_FileId = reader.readVarUintAs<int>();

if (reader.didOverflow()) {
    return false;
}
```

🛒 tech
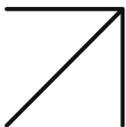
.riv – binary

```cpp
while (true) {
    auto propertyKey = reader.readVarUintAs<uint16_t>();
    if (propertyKey == 0) {
        // Terminator. https://media.giphy.com/media/7TtvTUMm9mp20/giphy.gif
        break;
    }

    if (reader.hasError()) {
        delete object;
        return nullptr;
    }
    if (object == nullptr || !object->deserialize(propertyKey, reader)) {
        // We have an unknown object or property, first see if core knows
        // the property type.
        int id = CoreRegistry::propertyFieldId(propertyKey);
        if (id == -1) {
            // No, check if it's in toc.
            id = header.propertyFieldId(propertyKey);
        }

        if (id == -1) {
            // Still couldn't find it, give up.
            fprintf(
                stderr, "Unknown property key %d, missing from property ToC.\n", propertyKey);
            delete object;
            return nullptr;
        }

        switch (id) {
            case CoreUintType::id:
                CoreUintType::deserialize(reader);
                break;
            case CoreStringType::id:
                CoreStringType::deserialize(reader);
                break;
            case CoreDoubleType::id:
                CoreDoubleType::deserialize(reader);
                break;
            case CoreColorType::id:
                CoreColorType::deserialize(reader);
                break;
        }
    }
}
```
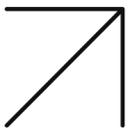
.riv – binary

```cpp
if (object->import(importStack) == StatusCode::Ok) {
    switch (object->coreType()) {
        case Backboard::typeKey:
            m_Backboard.reset(object->as<Backboard>());
            break;
        case Artboard::typeKey: {
            Artboard* ab = object->as<Artboard>();
            ab->m_Factory = m_Factory;
            m_Artboards.push_back(std::unique_ptr<Artboard>(ab));
        } break;
        case ImageAsset::typeKey: {
            auto fa = object->as<FileAsset>();
            m_FileAssets.push_back(std::unique_ptr<FileAsset>(fa));
        } break;
    }
} else {
    fprintf(stderr, "Failed to import object of type %d\n", object->coreType());
    delete object;
    continue;
}
```
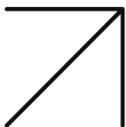
.riv – binary

```cpp
case Backboard::typeKey:
    stackObject = new BackboardImporter(object->as<Backboard>());
    break;
case Artboard::typeKey:
    stackObject = new ArtboardImporter(object->as<Artboard>());
    break;
case LinearAnimation::typeKey:
    stackObject = new LinearAnimationImporter(object->as<LinearAnimation>());
    break;
case KeyedObject::typeKey:
    stackObject = new KeyedObjectImporter(object->as<KeyedObject>());
    break;
case KeyedProperty::typeKey: {
    auto importer =
        importStack.latest<LinearAnimationImporter>(LinearAnimation::typeKey);
    if (importer == nullptr) {
        return ImportResult::malformed;
    }
    stackObject =
        new KeyedPropertyImporter(importer->animation(), object->as<KeyedProperty>());
    break;
}
```

tech
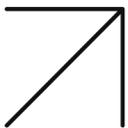
.riv – binary

```cpp
case StateMachine::typeKey:
    stackObject = new StateMachineImporter(object->as<StateMachine>());
    break;
case StateMachineLayer::typeKey: {
    auto artboardImporter = importStack.latest<ArtboardImporter>(ArtboardBase::typeKey);
    if (artboardImporter == nullptr) {
        return ImportResult::malformed;
    }

    stackObject = new StateMachineLayerImporter(object->as<StateMachineLayer>(),
                                                artboardImporter->artboard());

    break;
}
case EntryState::typeKey:
case ExitState::typeKey:
case AnyState::typeKey:
case AnimationState::typeKey:
case BlendState1D::typeKey:
case BlendStateDirect::typeKey:
    stackObject = new LayerStateImporter(object->as<LayerState>());
    stackType = LayerState::typeKey;
    break;
case StateTransition::typeKey:
case BlendStateTransition::typeKey:
    stackObject = new StateTransitionImporter(object->as<StateTransition>());
    stackType = StateTransition::typeKey;
    break;
```
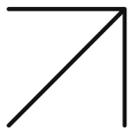
tech

Саммари: Rive

- Единый процесс создания и проигрывания

tech

Саммари: Rive

- Единый процесс создания и проигрывания

- Много приятных фич

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Саммари: Rive

- Единый процесс создания и проигрывания

- Много приятных фич

- Поддержка большинства платформ

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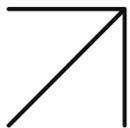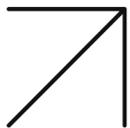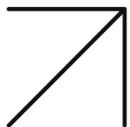
Саммари: Rive

- Единый процесс создания и проигрывания

- Много приятных фич

- Поддержка большинства платформ

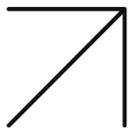- Конвертер Lottie -> Rive

Сравнение производительности

Lottie vs **Rive**
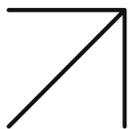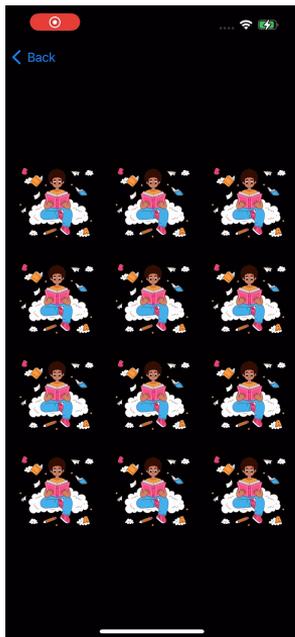
Пример 1

Простые трансформации
позиции элементов

Пример 1

Rive
Lottie

Rive
Lottie

RAM: 35 MB   72 MB

tech
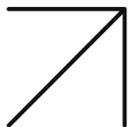
Пример 1

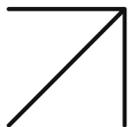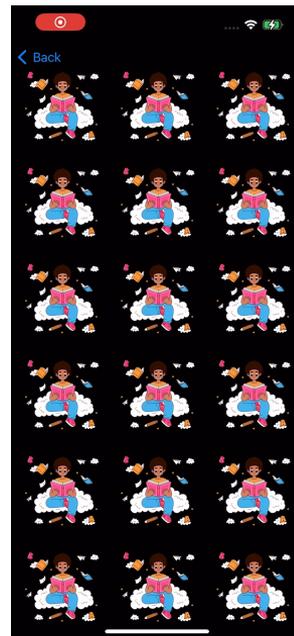RAM: 51 MB   84 MB

tech
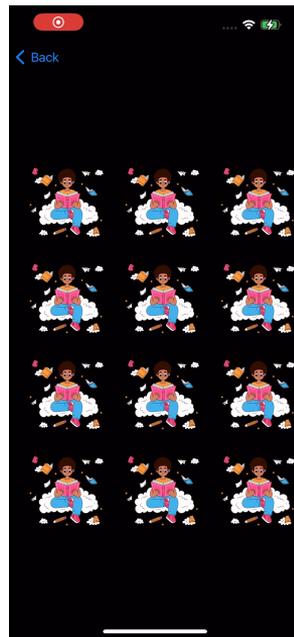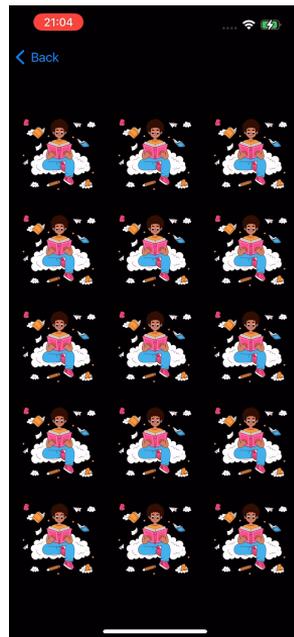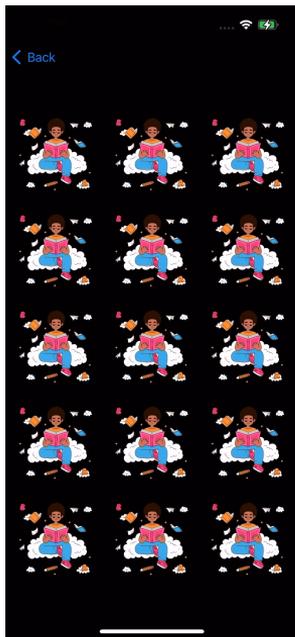
Пример 1

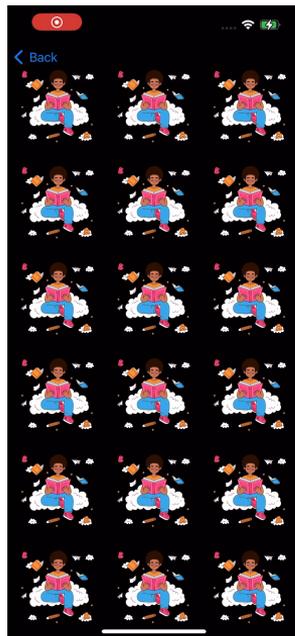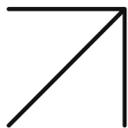

RAM: 57 MB   96 MB

Пример 1

RAM: 65 MB   107 MB

tech
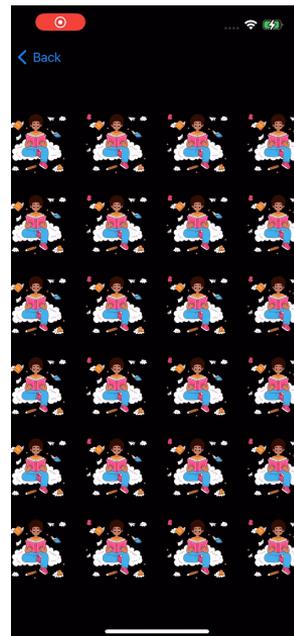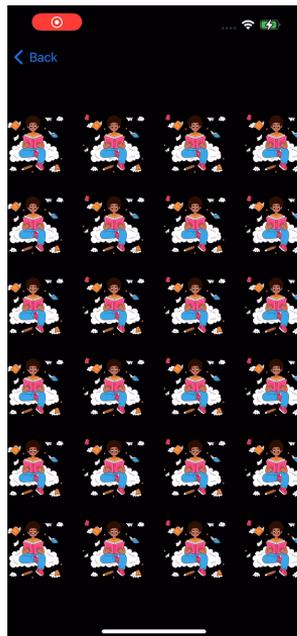
Пример 1

RAM: 80 MB   110 MB
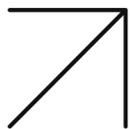
tech
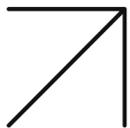
Пример 2

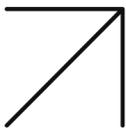Простые трансформации
позиции элементов

+ изменение path у svg

Убиваем Lottie?
Тащим Rive?

@PROKOPIEVEVGENI

Спасибо за внимание

P.S. Ловите на площадке, поговорим про анимации

tech