



Desenvolvendo aplicativos acessíveis

Tornando seu app disponível para todos

A thick, wavy line in a light blue color starts from the left edge of the slide and curves downwards and then slightly upwards towards the bottom center.

Diego Malone

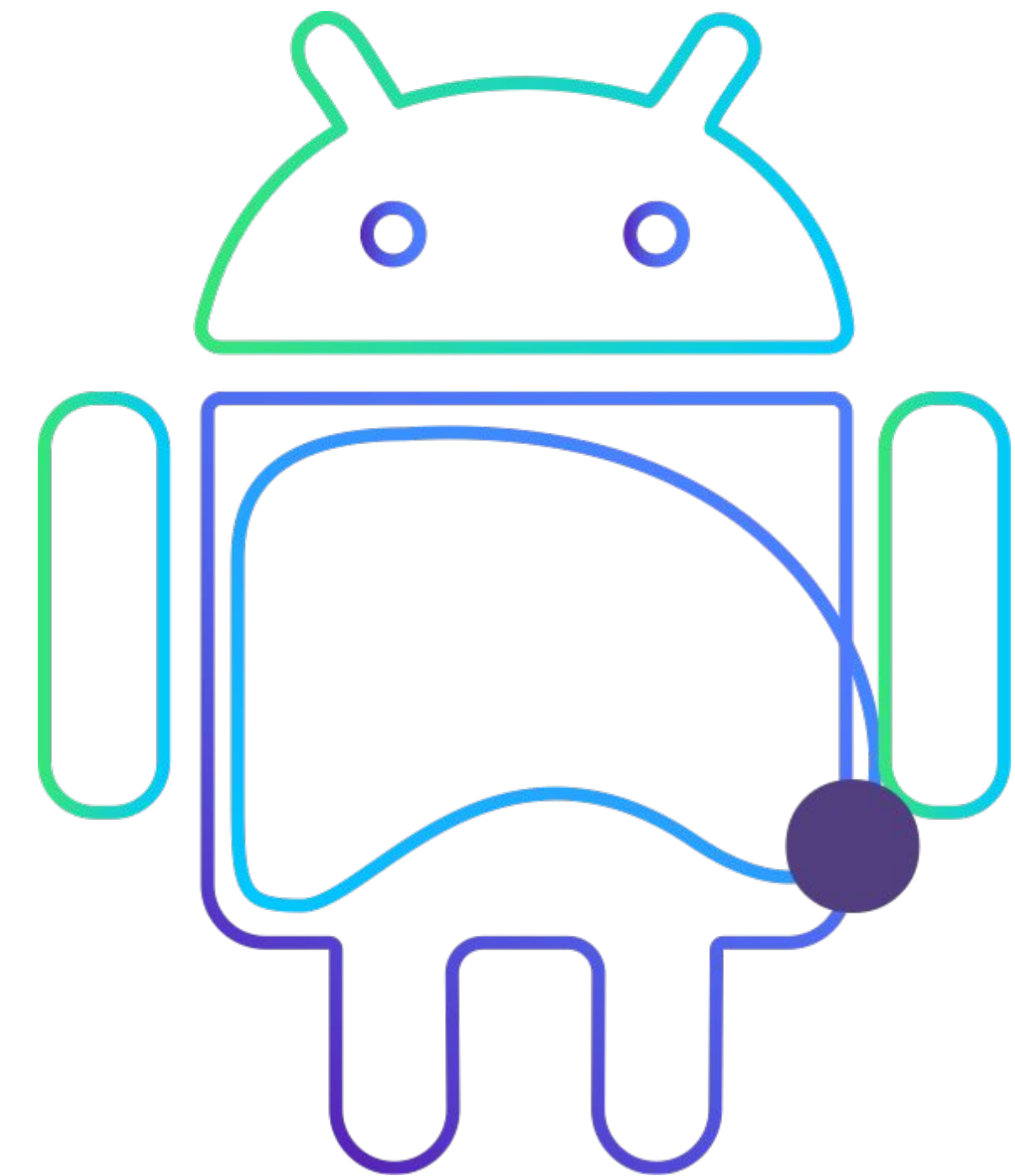
Sobre Mim

- Chapter Leader Android na Concrete
- Carioca
- Passado escrito em PHP



Agenda

-
- O que é acessibilidade?
- Tecnologias assistivas
- Serviços de acessibilidade
- Framework de acessibilidade
- Boas práticas





O que é acessibilidade?



O que é acessibilidade?

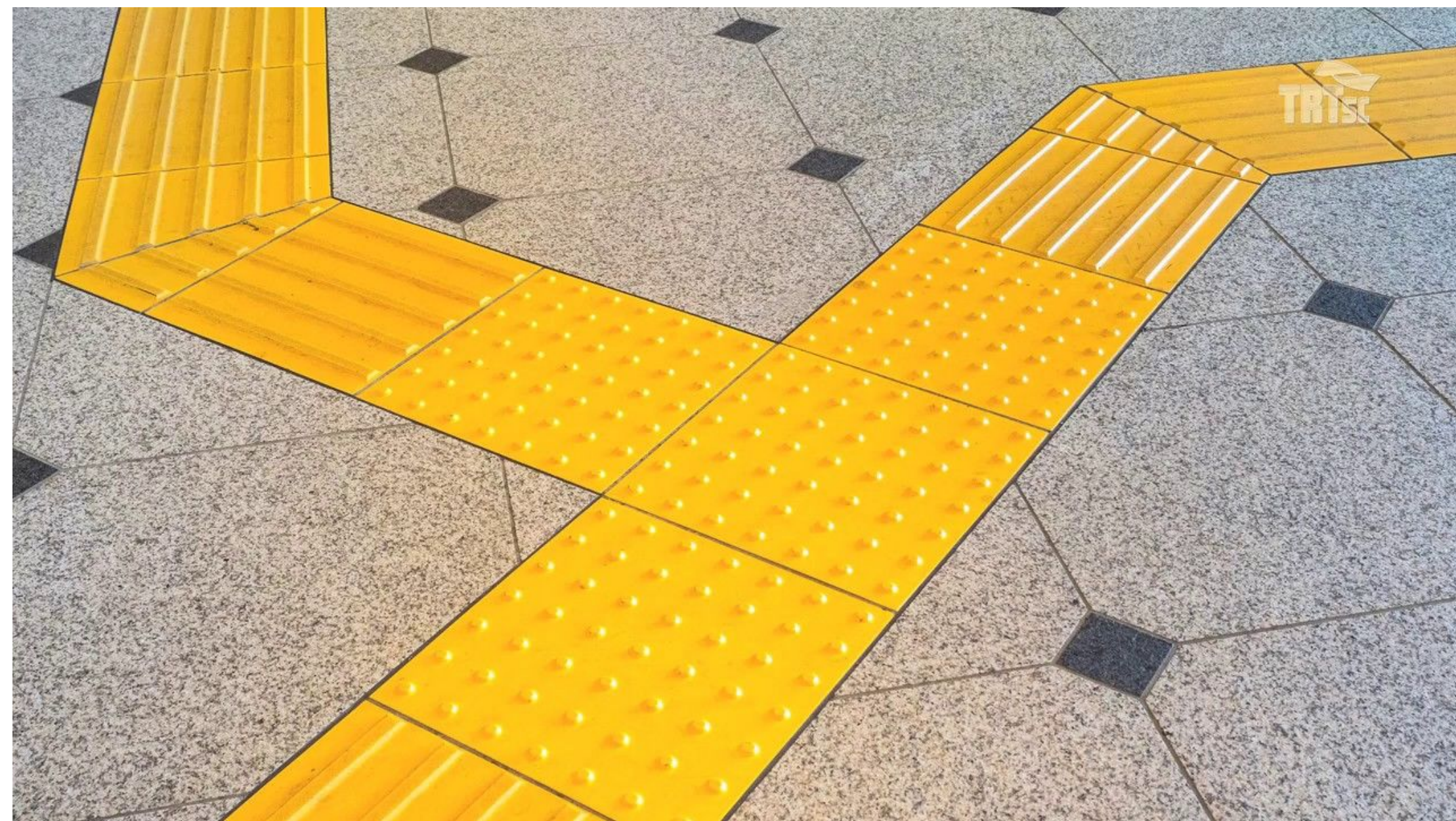
Consegue ler agora?

Acessibilidade

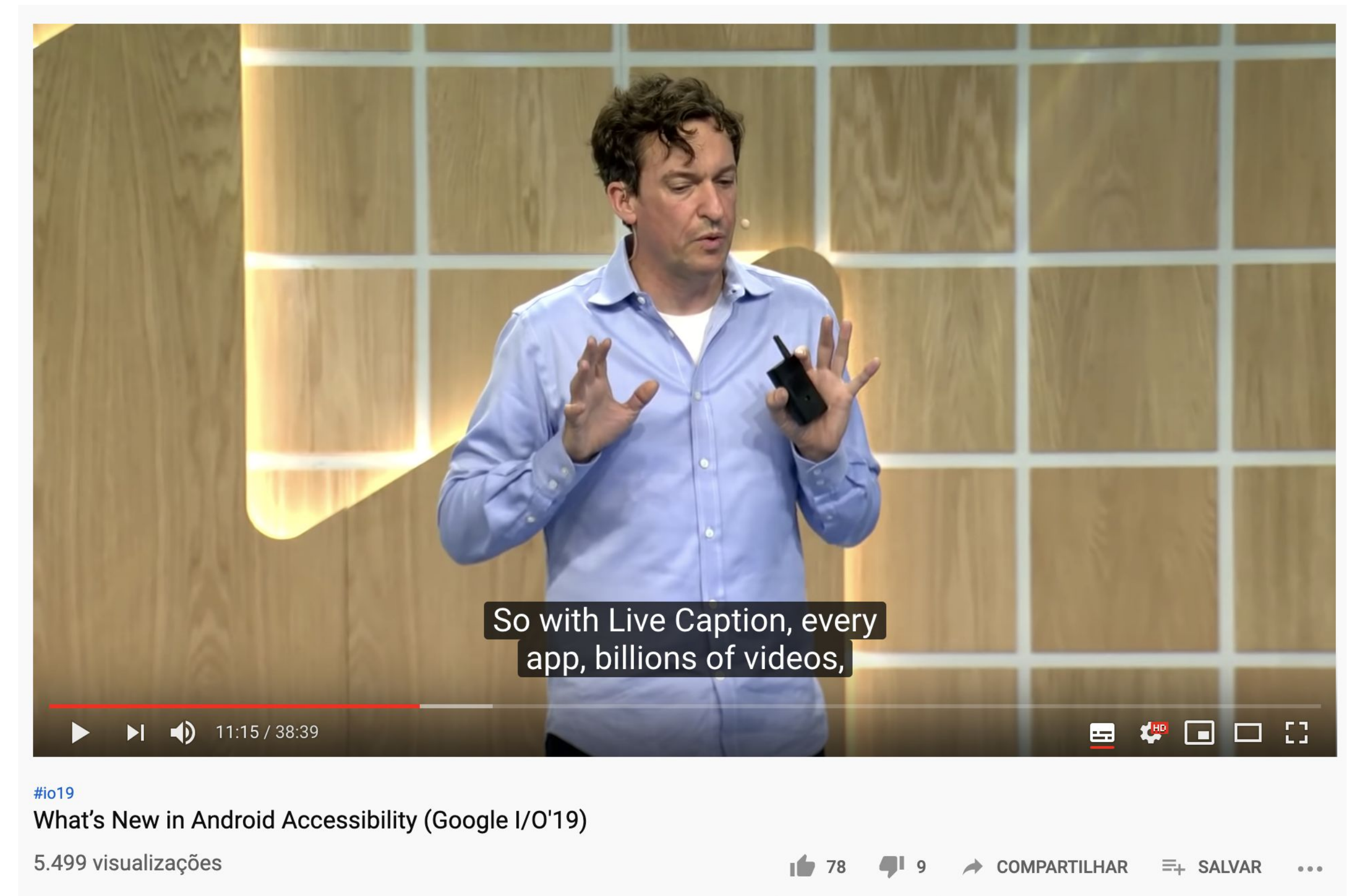
“possibilidade e condição de alcance para utilização, com segurança e autonomia, de espaços, mobiliários, [...] sistemas e tecnologias, [...] por pessoa com deficiência ou com mobilidade reduzida;”

Fonte: Lei 13.146/2015

Na prática



A acessibilidade traz benefícios para todos

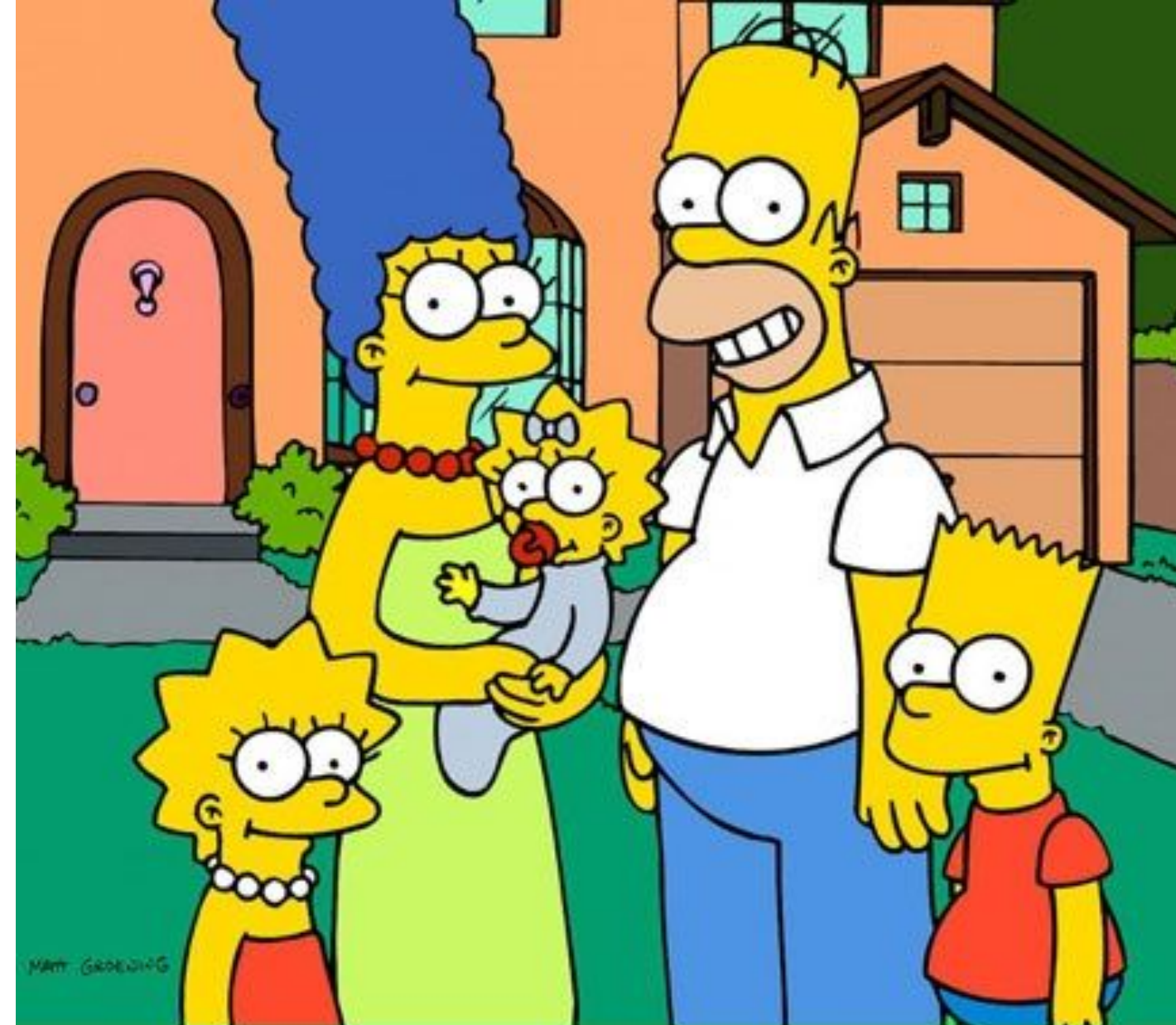


Fonte: <https://smartgrowth.org/curb-cut-effect/>

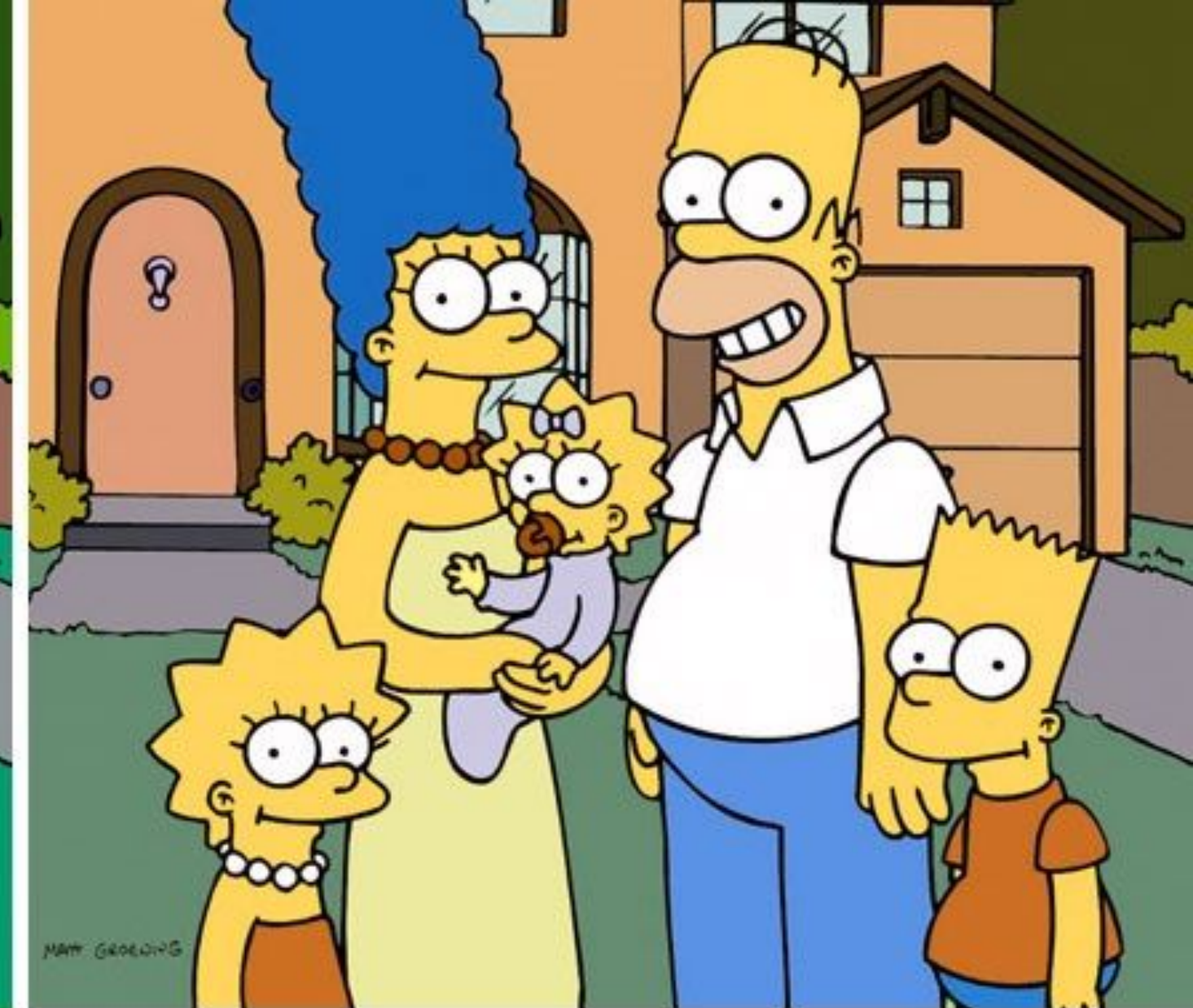
Daltonismo



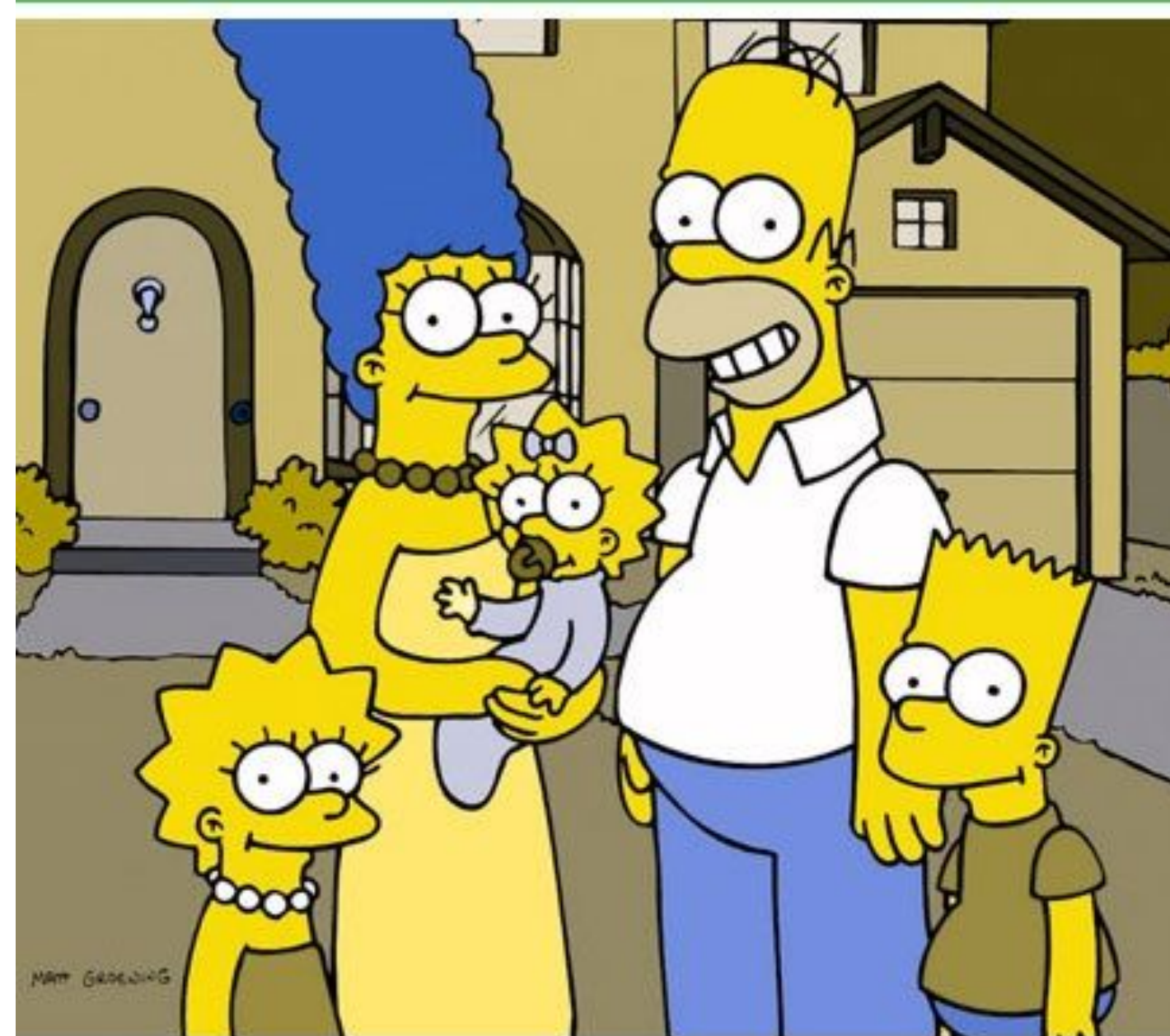
Fonte: <https://bit.ly/2krok27>



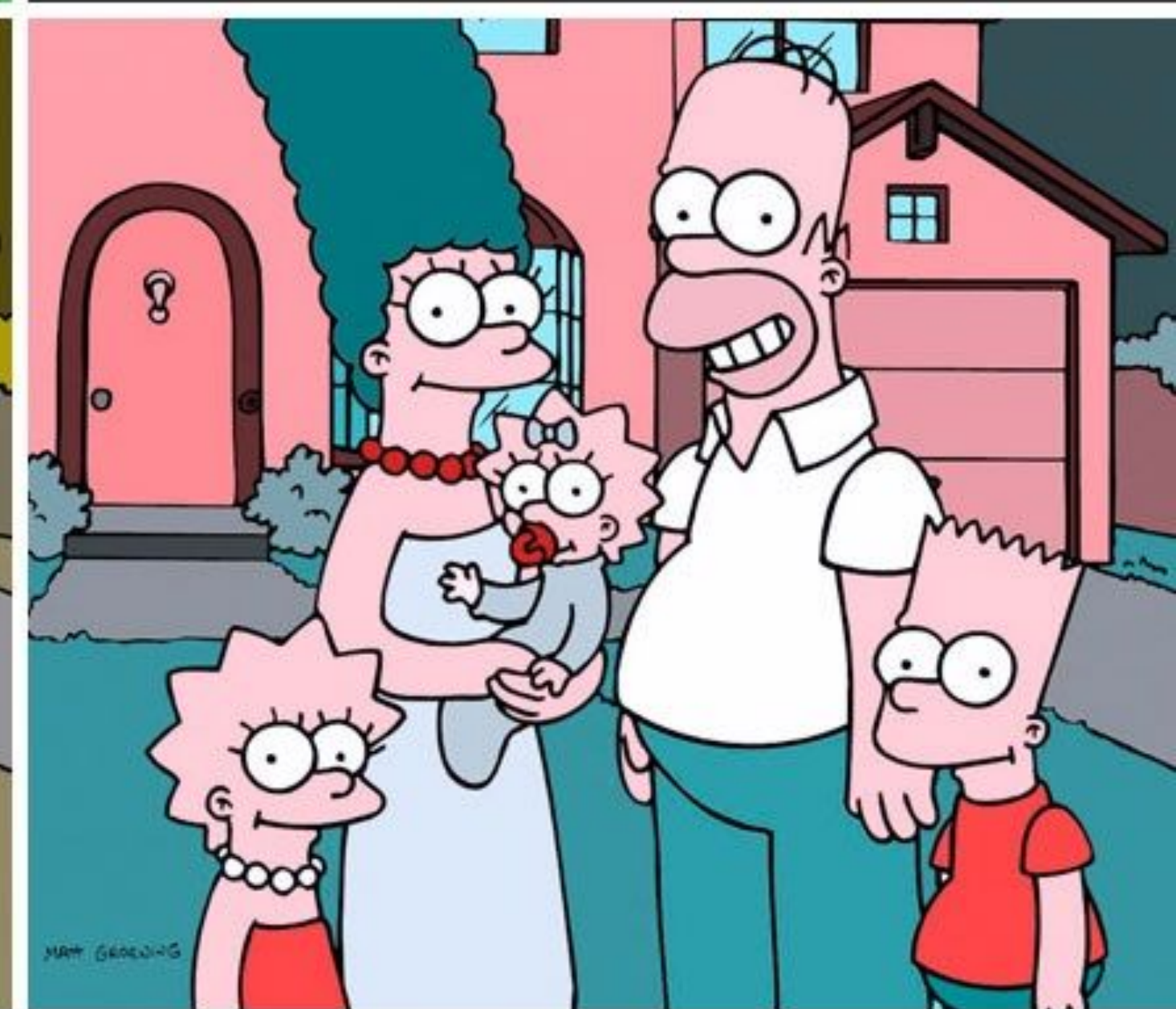
VISÃO NORMAL



DEUTERANOMALIA



PROTANOPIA



TRITANOPIA

Daltonismo



Fonte: <https://bit.ly/2krok27>



VISÃO NORMAL



DEUTERANOMALIA



PROTANOPIA



TRITANOPIA

Daltonismo



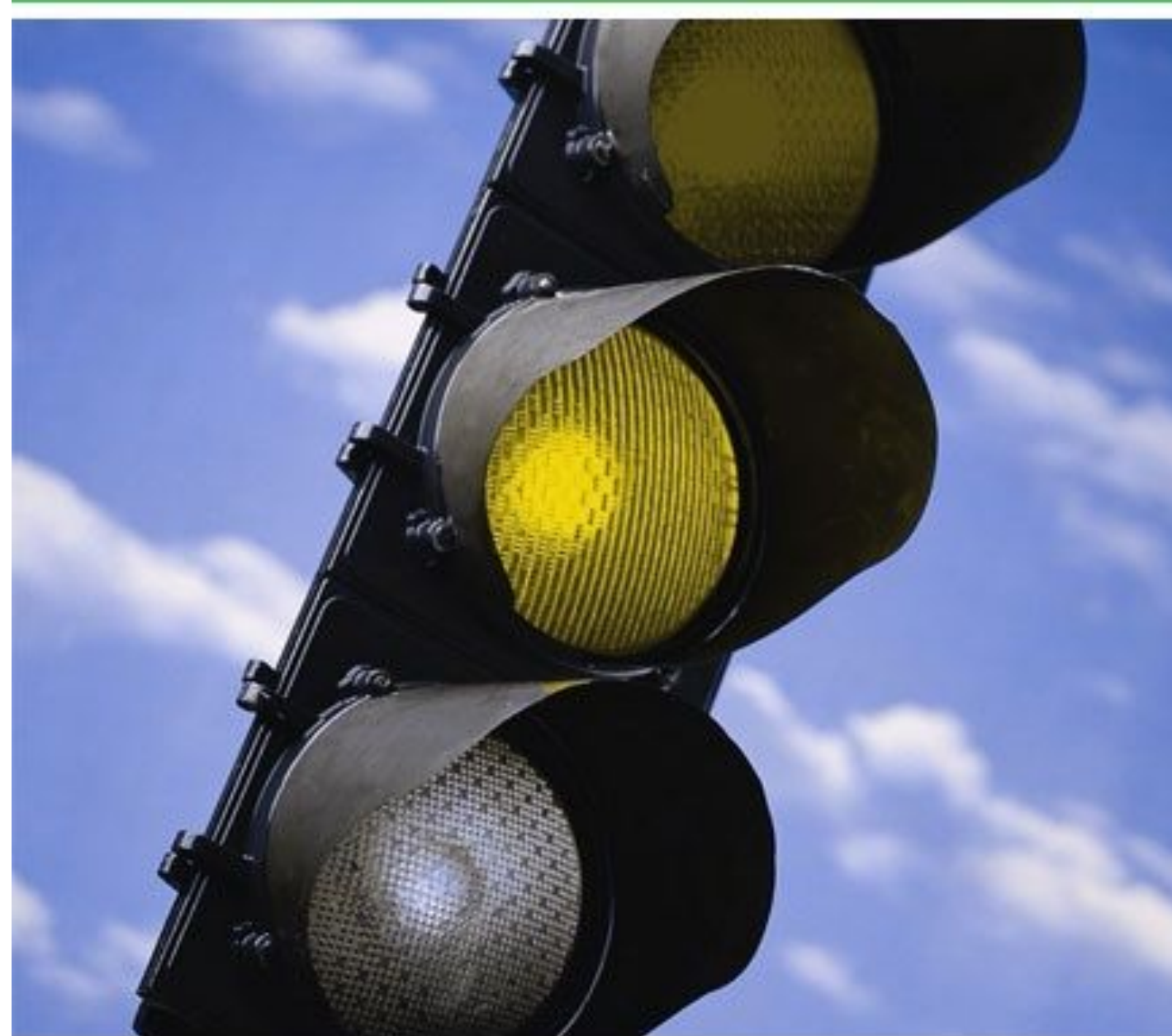
Fonte: <https://bit.ly/2krok27>



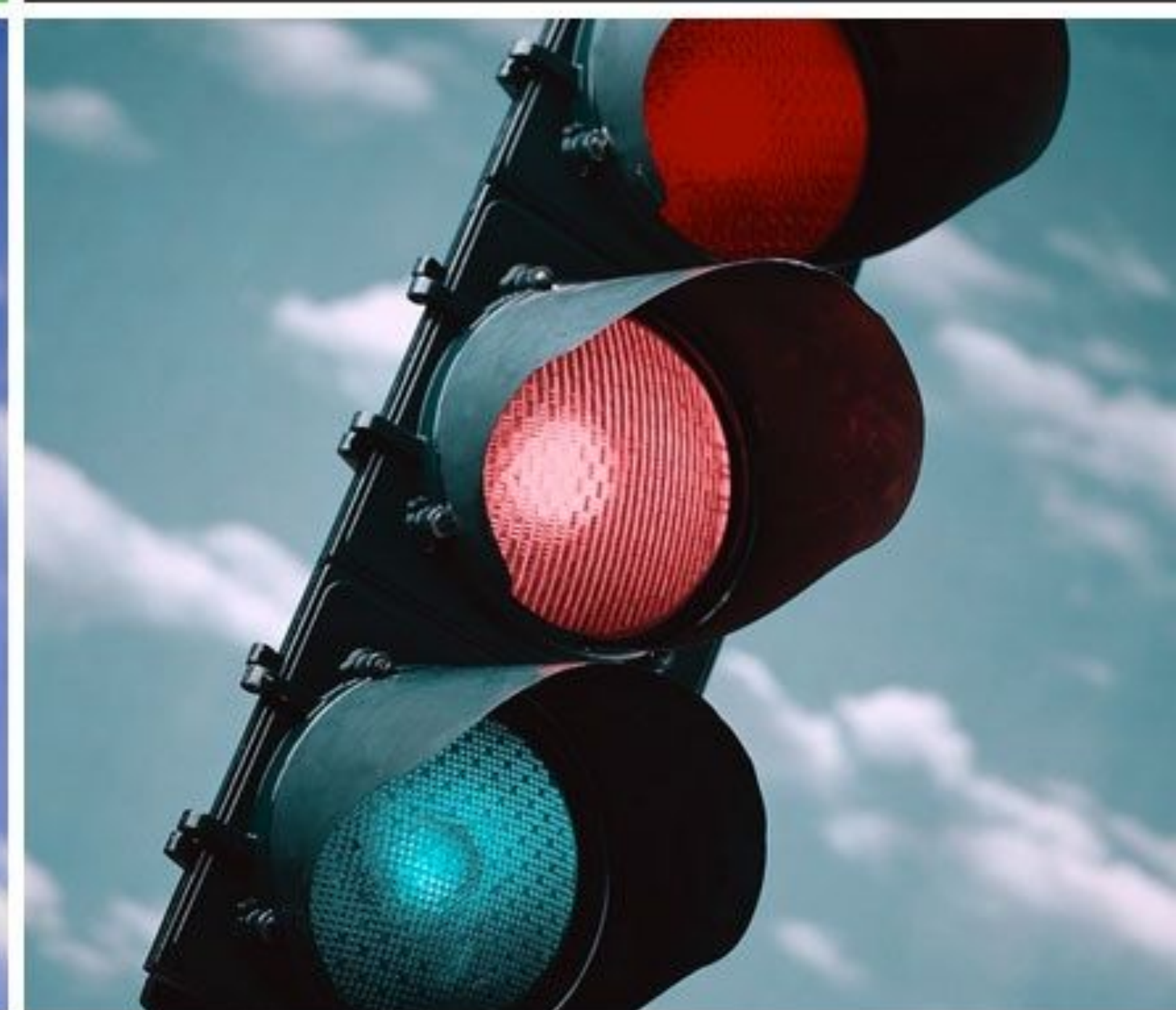
VISÃO NORMAL



DEUTERANOMALIA

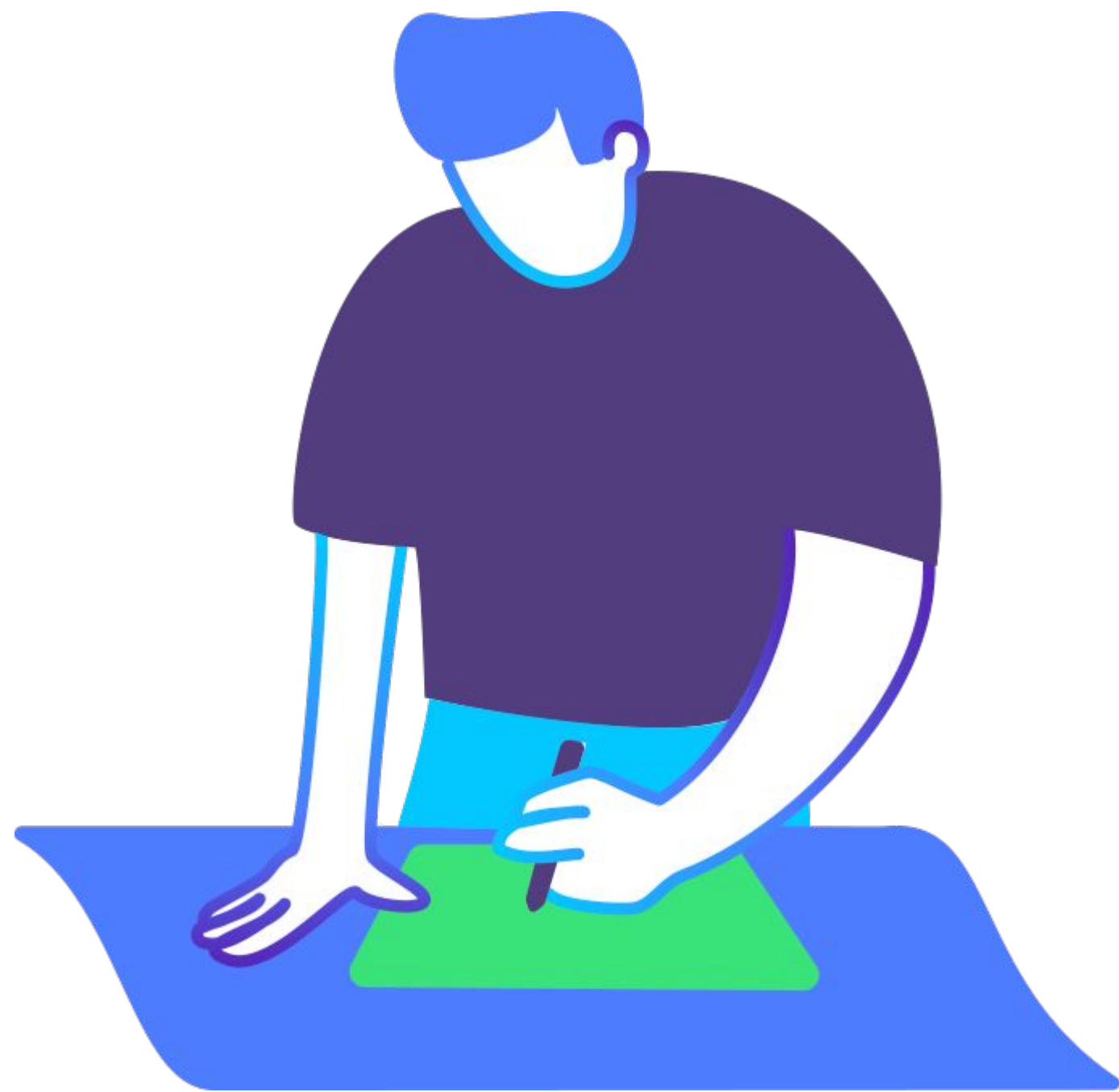


PROTANOPIA



TRITANOPIA

Canhotos



Fonte: <https://bit.ly/2jV8Pz5>



Canhotos















Fonte: <https://amzn.to/2jWjedU>



Fonte: <https://bit.ly/2jTyPLe>

Tipos de deficiência

- - Permanente, temporária ou situacional
 - Toque
 - Visão
 - Audição
 - Fala

	Permanent	Temporary	Situational
Touch	 One arm	 Arm injury	 New parent
See	 Blind	 Cataract	 Distracted driver
Hear	 Deaf	 Ear infection	 Bartender
Speak	 Non-verbal	 Laryngitis	 Heavy accent

Tipos de deficiência



Toque



Um braço

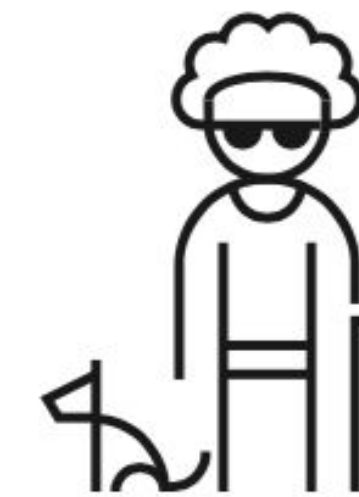


Braço
Imobilizado



Filho pequeno

See



Blind



Cataract



Distracted driver

Hear



Deaf



Ear infection



Bartender

Speak



Non-verbal



Laryngitis



Heavy accent

Tipos de deficiência



Visão






Cego









Catarata



Dirigindo

	Permanent	Temporary	Situational
Touch	 One arm	 Arm injury	 New parent

Hear	 Deaf	 Ear infection	 Bartender
------	---	--	--

Speak	 Non-verbal	 Laryngitis	 Heavy accent
-------	---	---	---

Tipos de deficiência



Audição



Surda



Infecção de ouvido



Bartender

	Permanent	Temporary	Situational
Touch	 One arm	 Arm injury	 New parent
See	 Blind	 Cataract	 Distracted driver
Speak	 Non-verbal	 Laryngitis	 Heavy accent

Tipos de deficiência



Fala












Mudo



Laringite

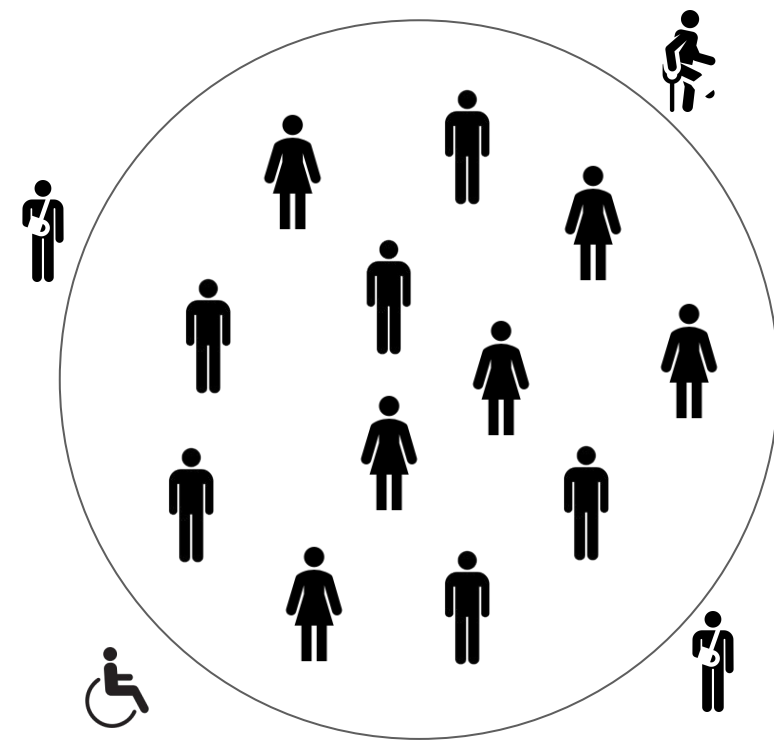


Sotaque

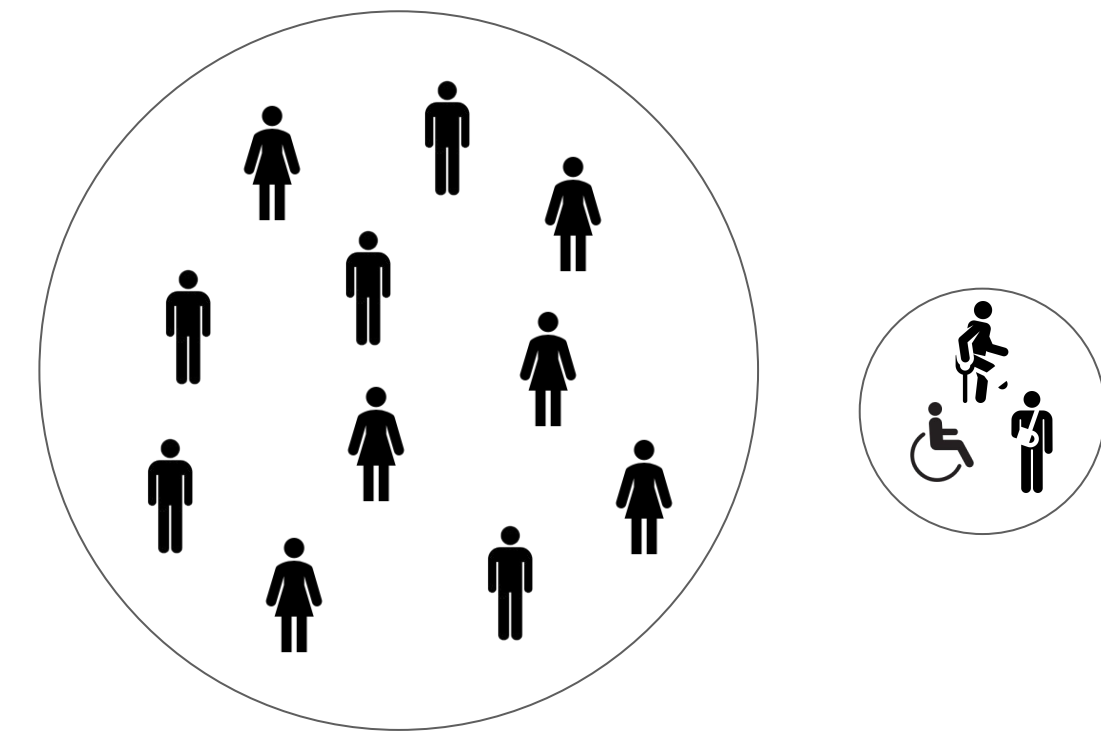
	Permanent	Temporary	Situational
Touch	 One arm	 Arm injury	 New parent
See	 Blind	 Cataract	 Distracted driver
Hear	 Deaf	 Ear infection	 Bartender

Fases da inclusão

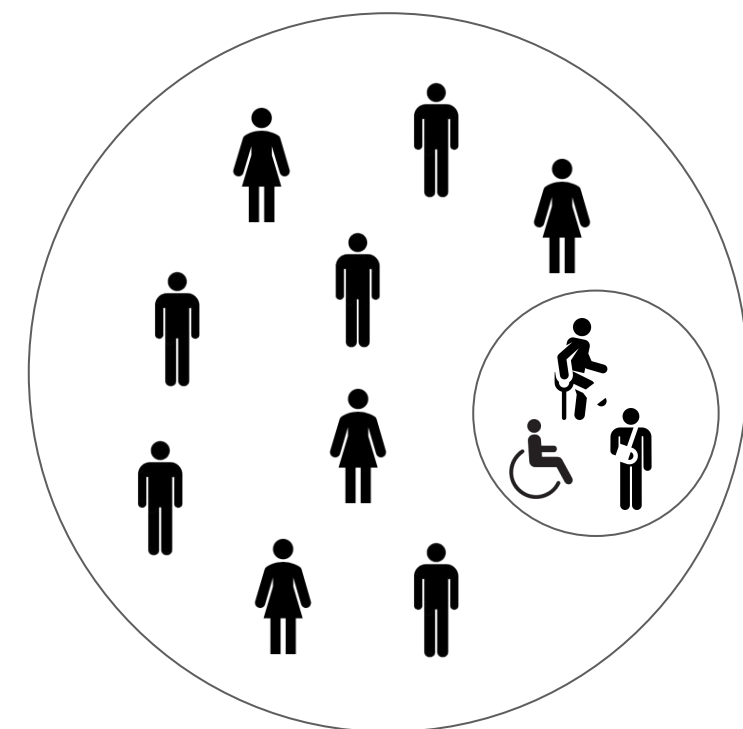
Exclusão



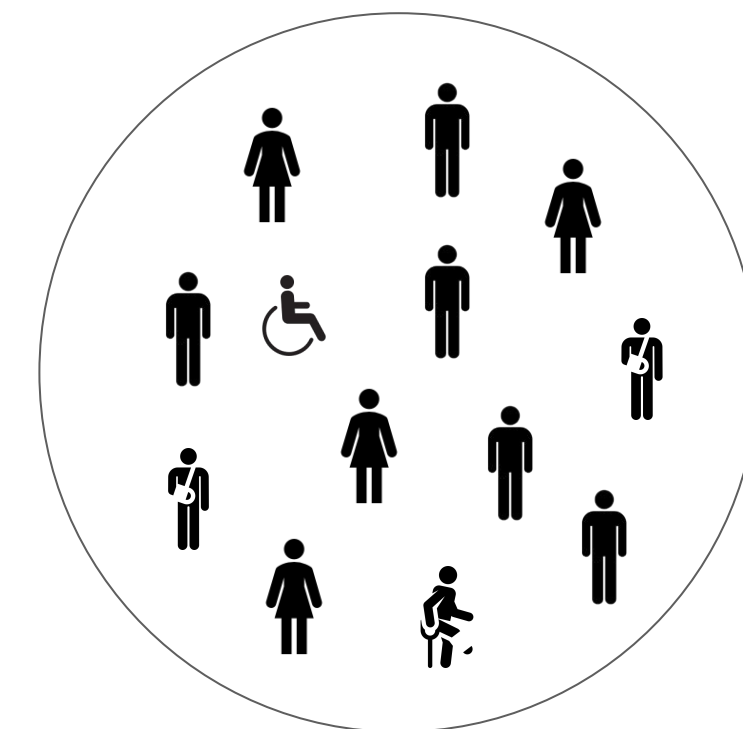
Segregação



Integração



Inclusão



Pessoas com deficiência no Brasil

45,6 milhões de pessoas

23% da população brasileira

Fonte: Censo 2010



E o quanto consideramos essas pessoas no desenvolvimento dos nossos aplicativos?

“[...] A menos que você tome uma decisão geral de que as pessoas com deficiências não façam parte do seu público, realmente não pode dizer que seu site é usável a menos que seja acessível.”

Steve Krug

Fonte: Não me faça pensar, 2014

Usabilidade?



Fonte: <https://bit.ly/2koj6nC>

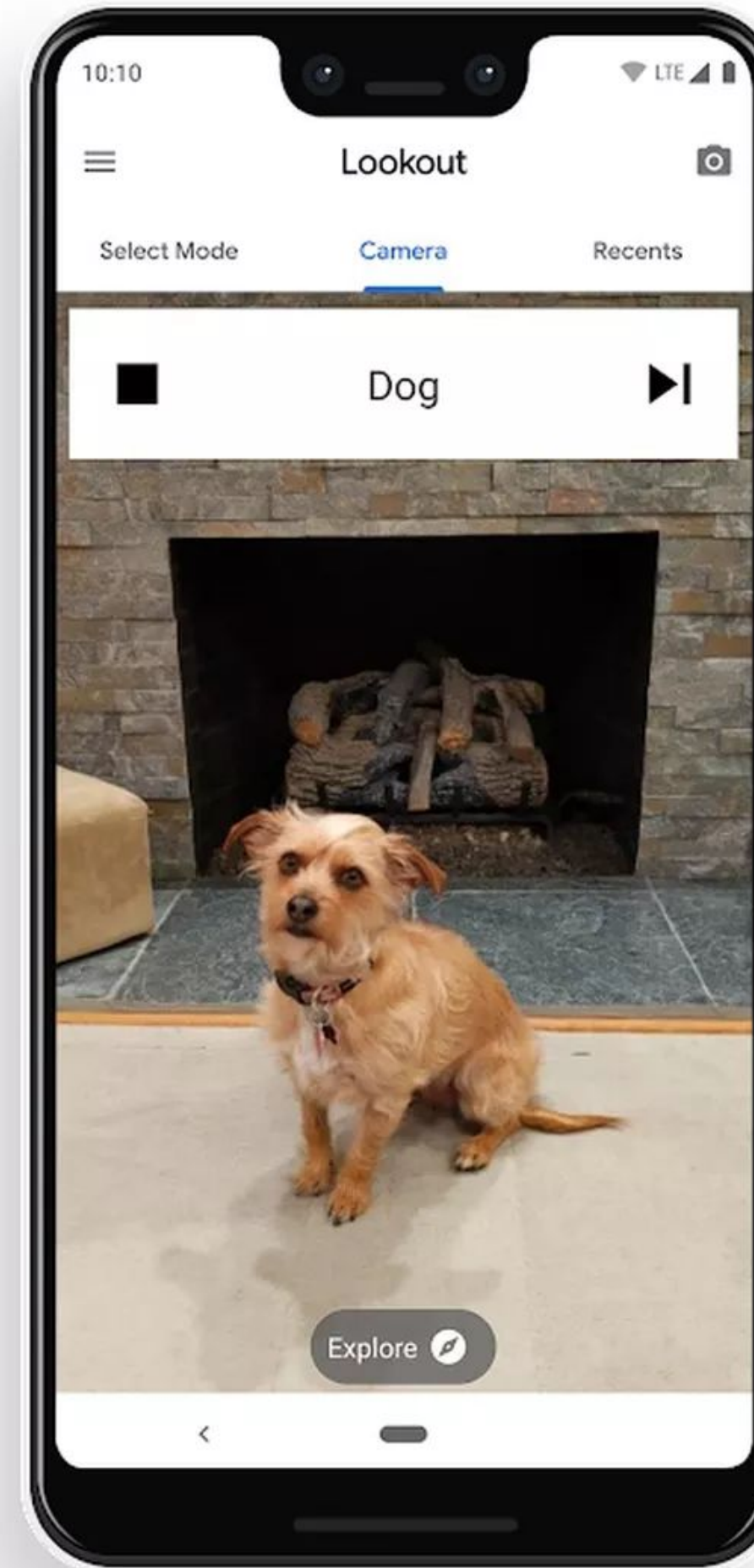
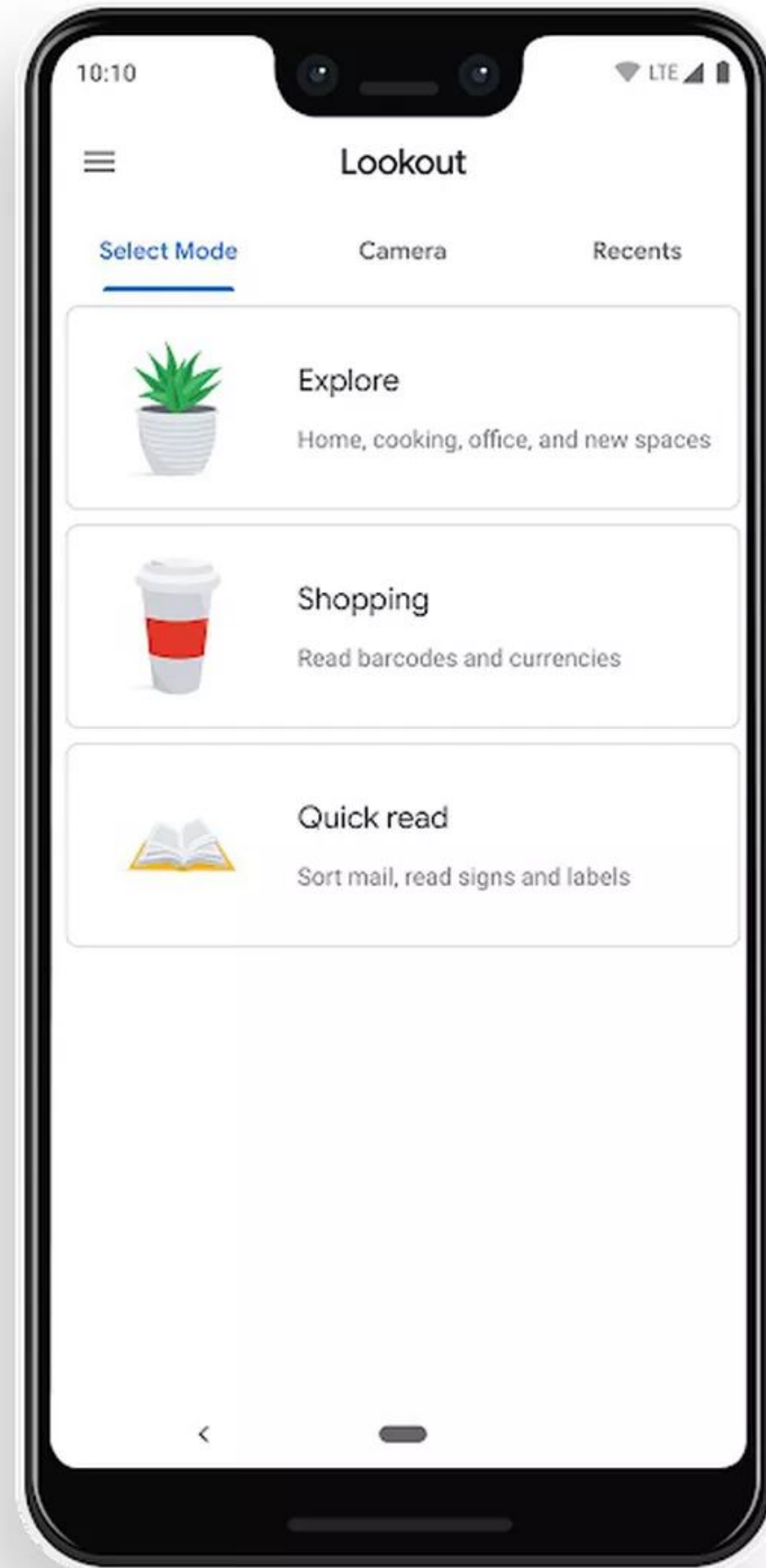


androidcen



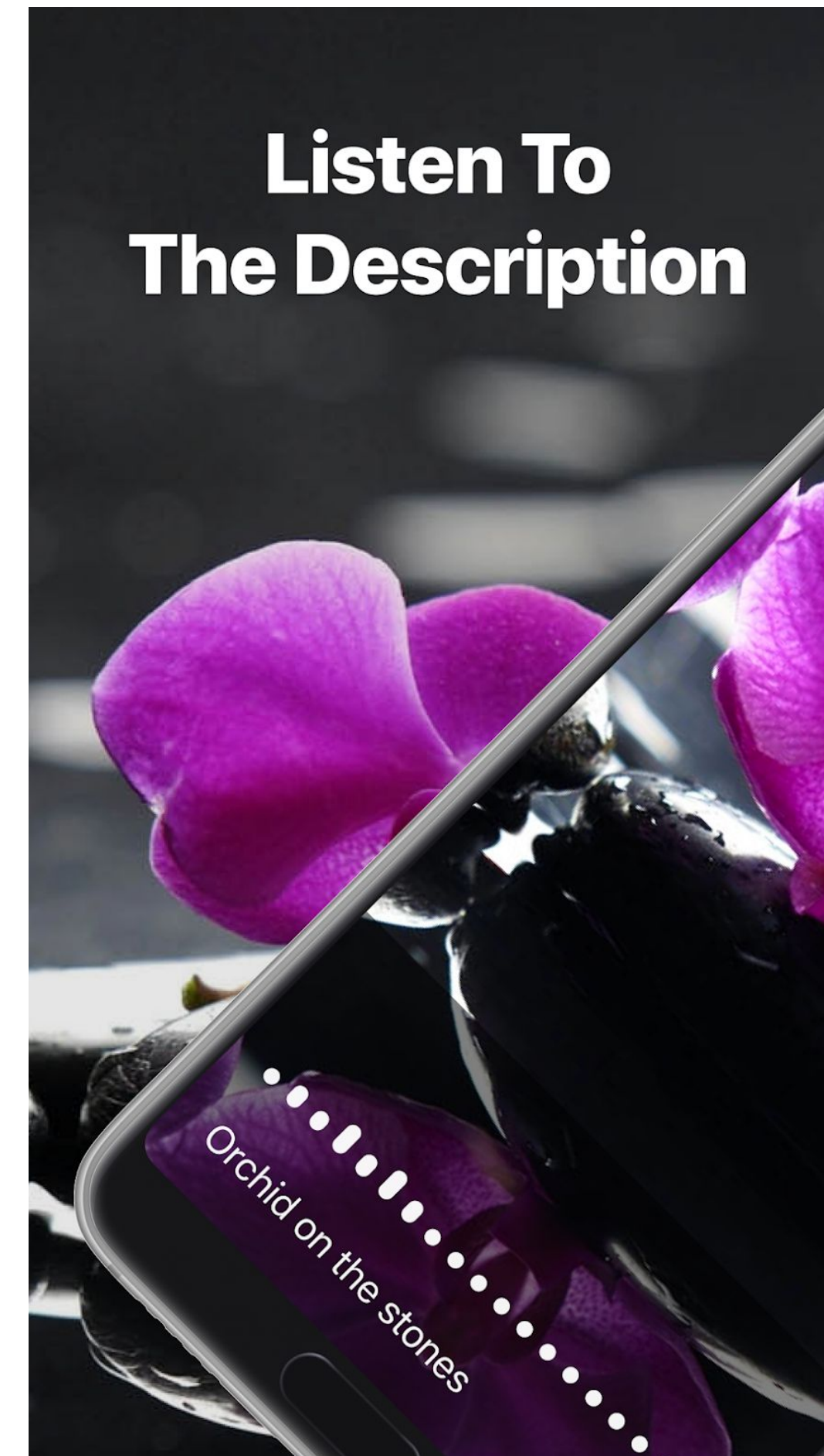
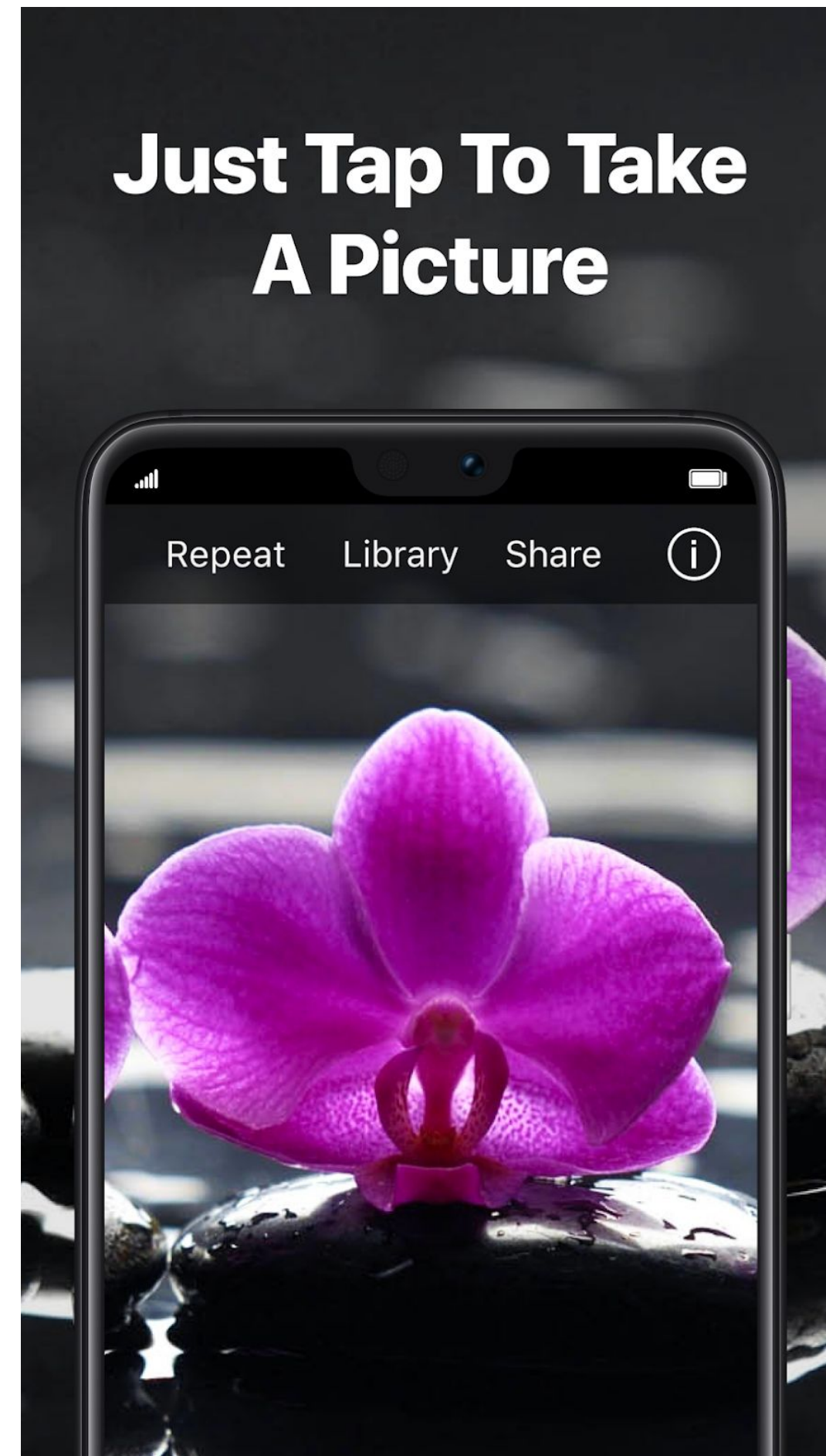
Tecnologias Assistivas

Lookout



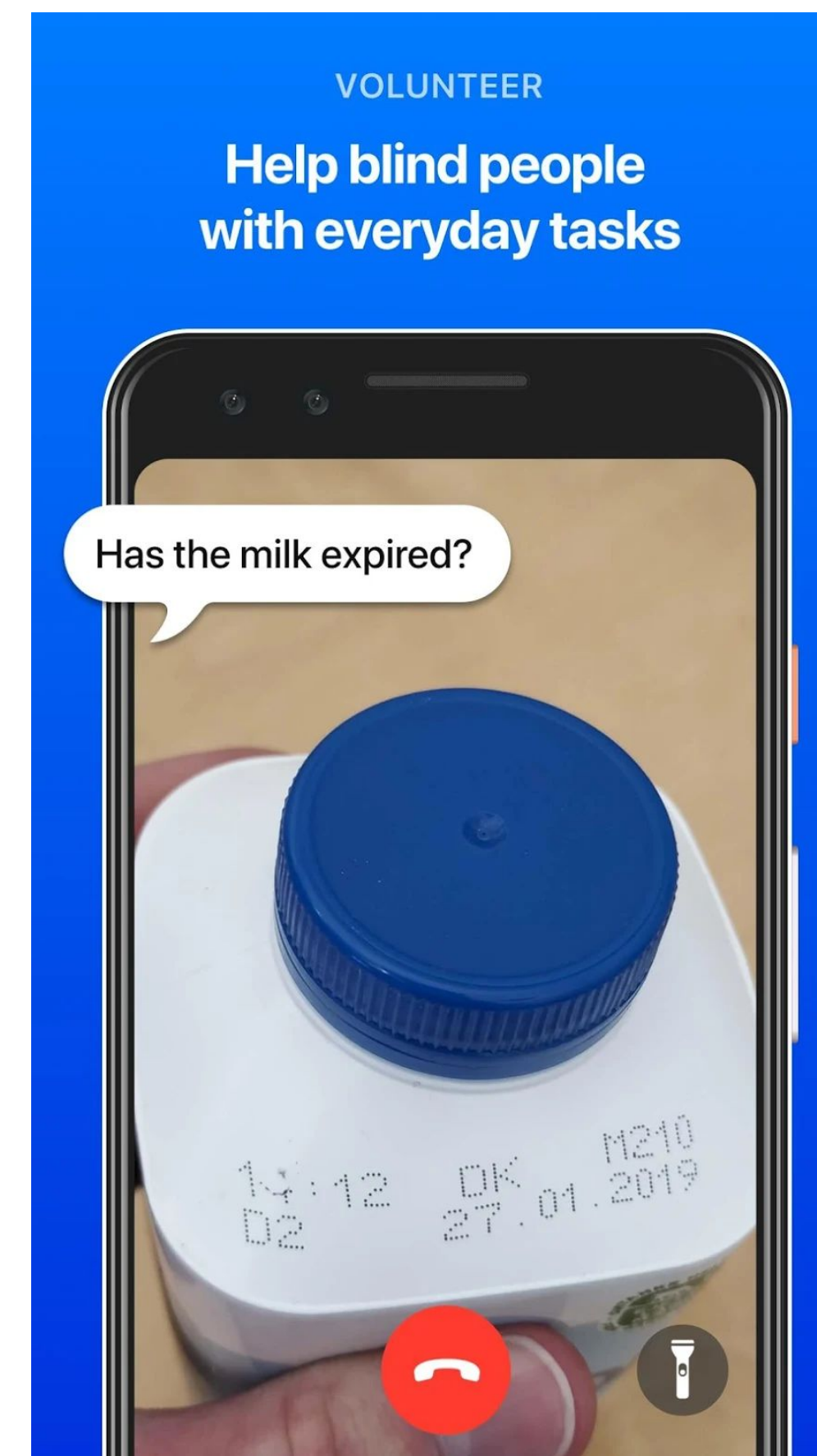
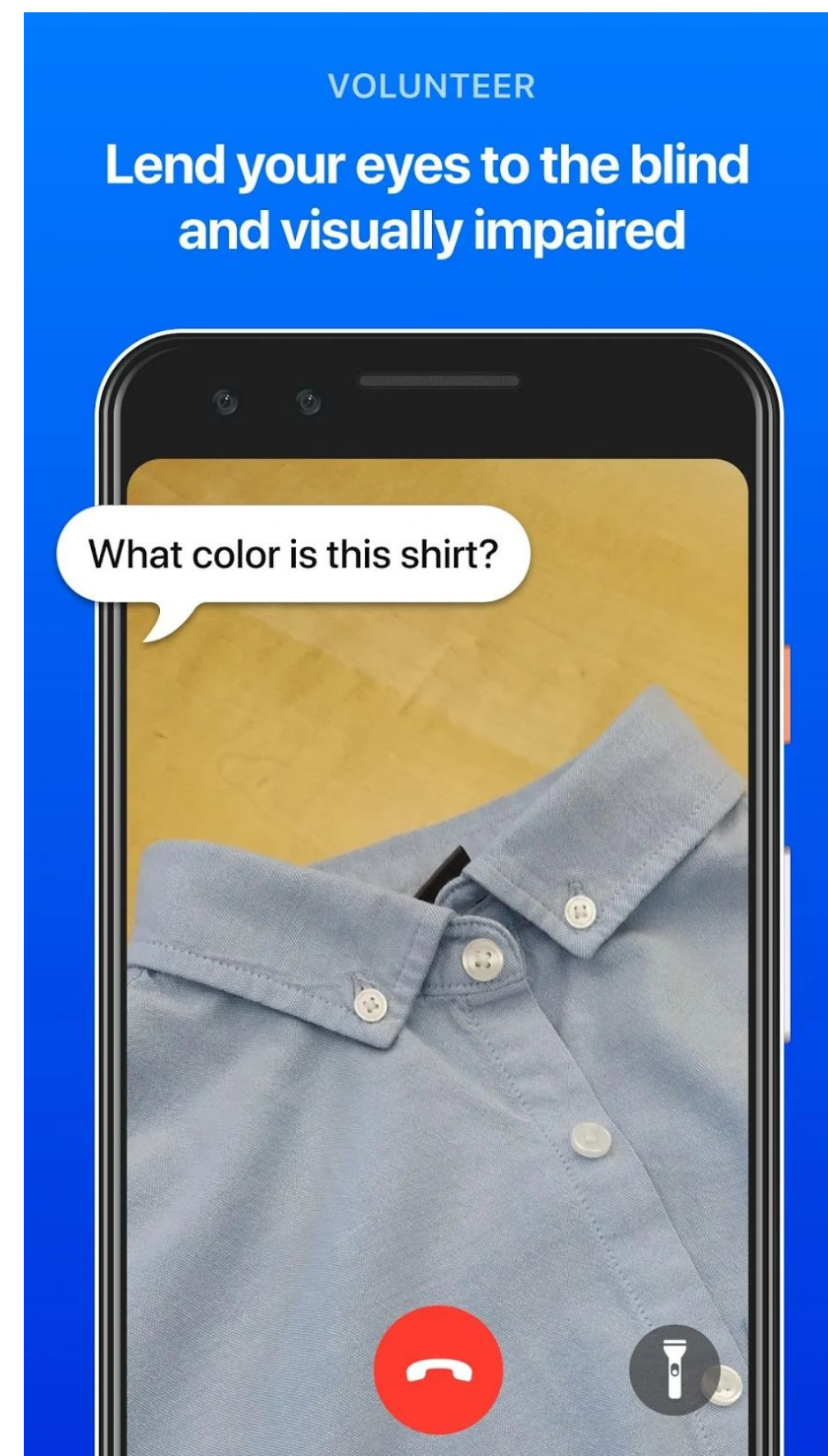
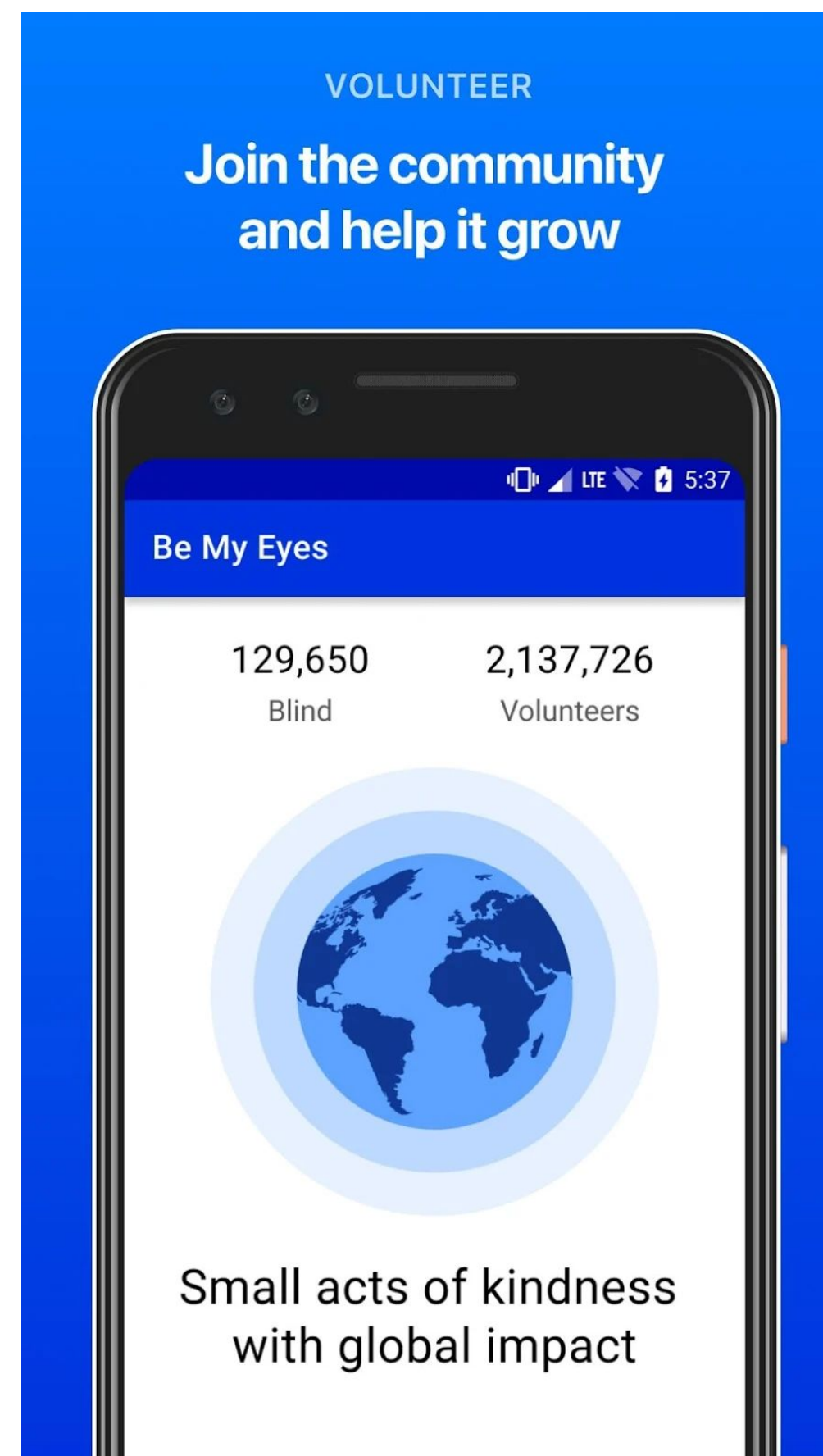
<https://www.youtube.com/watch?v=k1mz7b-A22c>

TapTapSee



<https://taptapseeapp.com/>

Be My Eyes



<https://www.bemyeyes.com>

Chord Assist



<http://bit.ly/chord-assist>

Live Caption



The image displays a composite of three screenshots illustrating the Live Caption feature. On the left, a video player shows a woman eating a donut with a live caption: "[Laughter] mmm this donut is so good, sprinkles are my favorite. But why do donuts have holes?". The video progress bar shows 0:11 out of 0:27. In the center, a text message conversation with 'Ryan' shows several video attachments with live captions: "00:08 7:34PM", "00:12 7:40PM", "00:19 7:42PM", and "00:23 Now". A text message in the conversation reads: "That would be awesome! I'll finish work around 8 so I can meet you there. See you soon." On the right, a social media feed shows a tweet from Barron Webster (@WarronBebster) with a video of a koala and a live caption: "I sleep 22 hours a day, eat eucalyptus leaves and just hang out. It's the best." Below it is a tweet from Mercy Lomelin (@mercylomelin) with a video of a plant and a live caption: "I officially have 47 plants as of yesterday." The social media interface includes navigation icons for home, search, notifications, and messages.

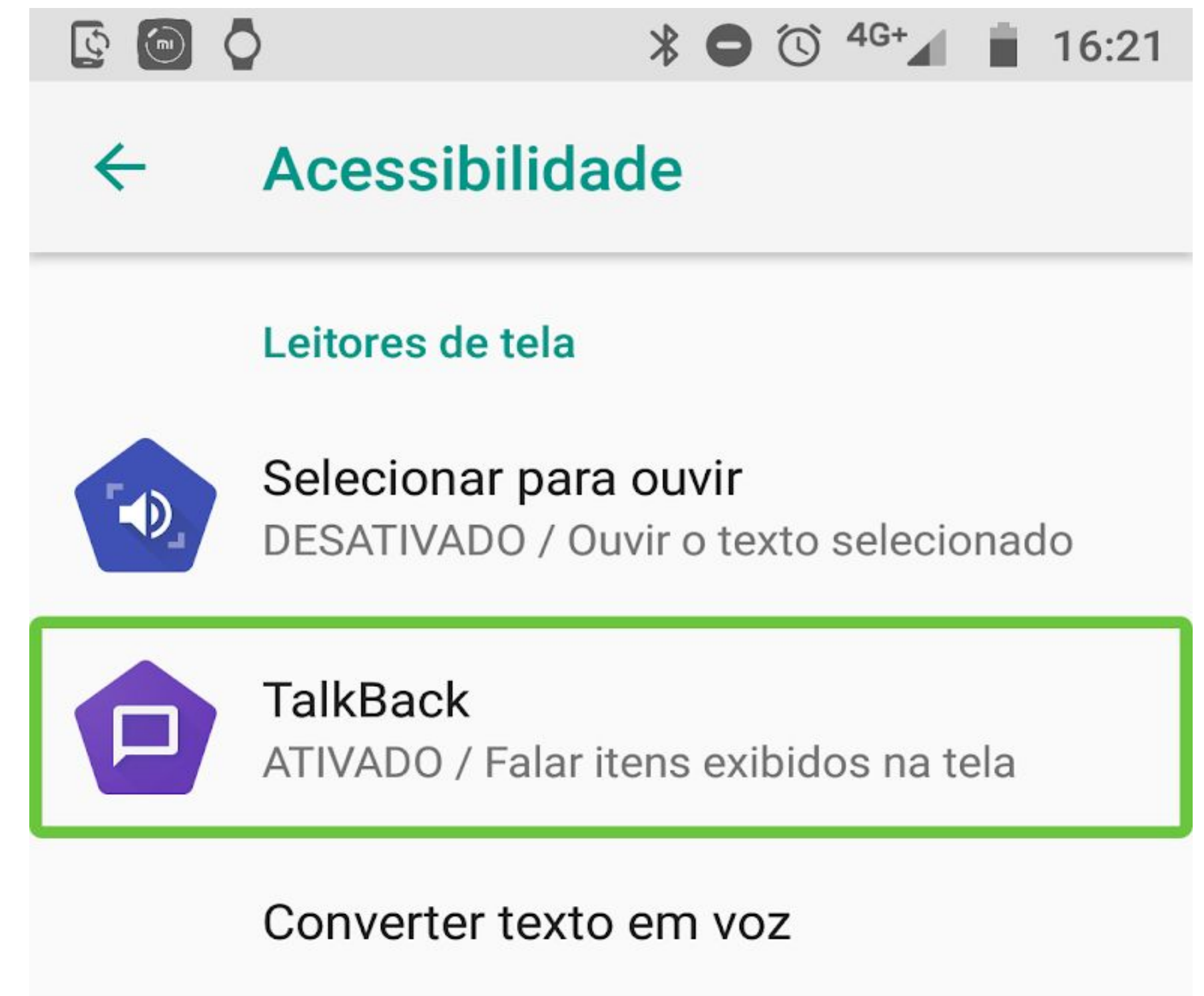
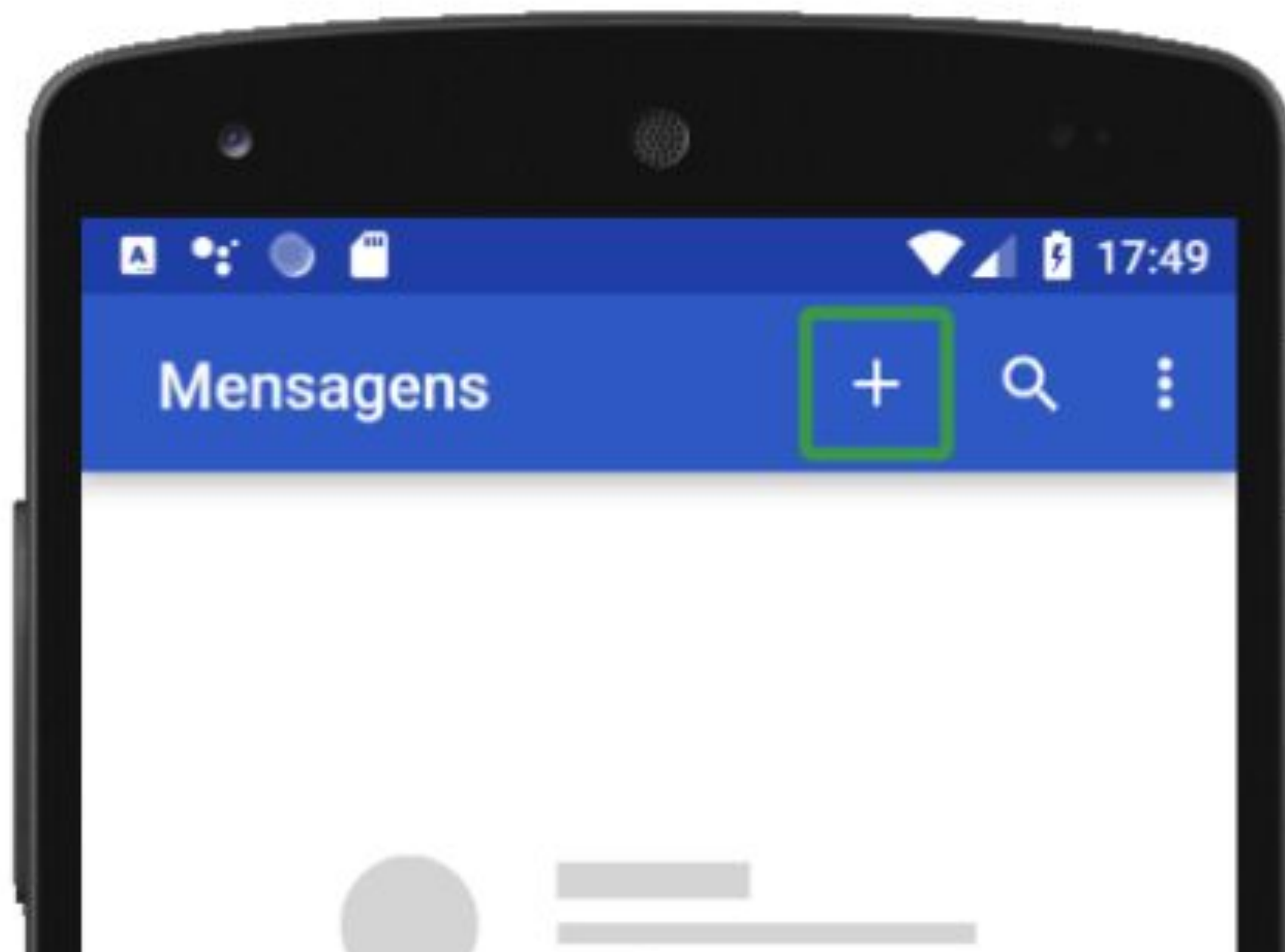
<https://www.youtube.com/watch?v=hPv1PkjJ-J0>



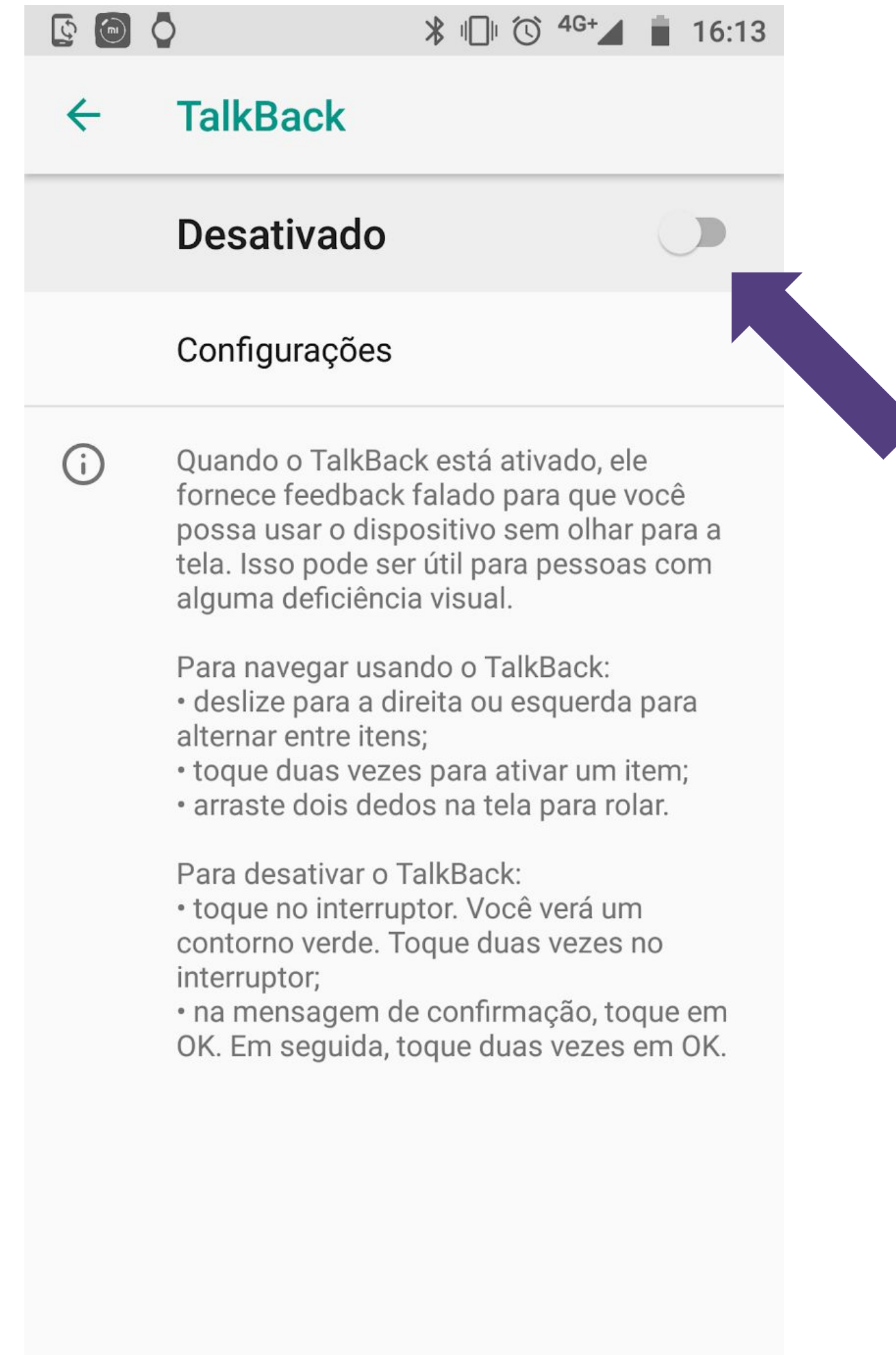
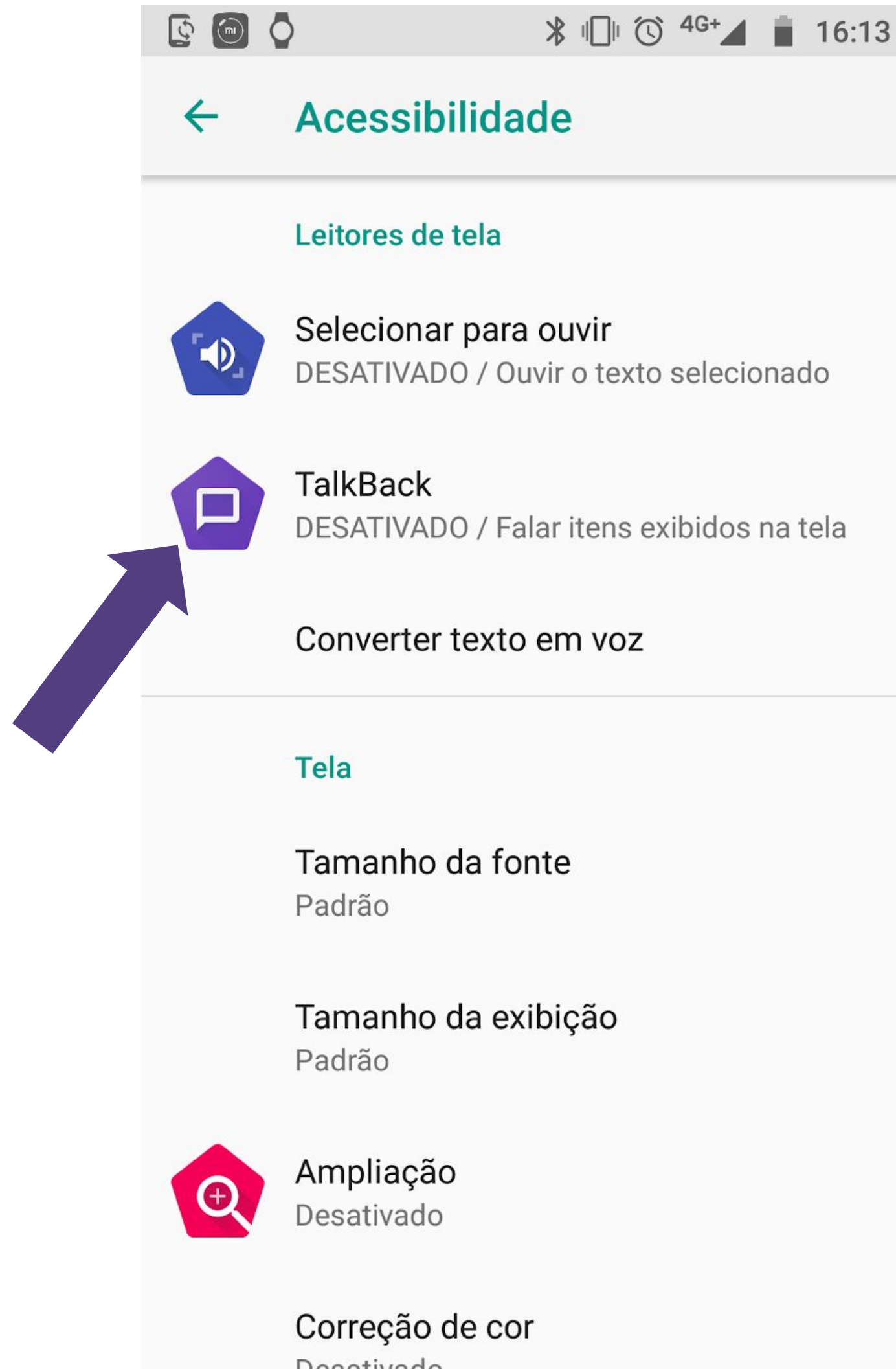
Serviços de Acessibilidade

Talkback

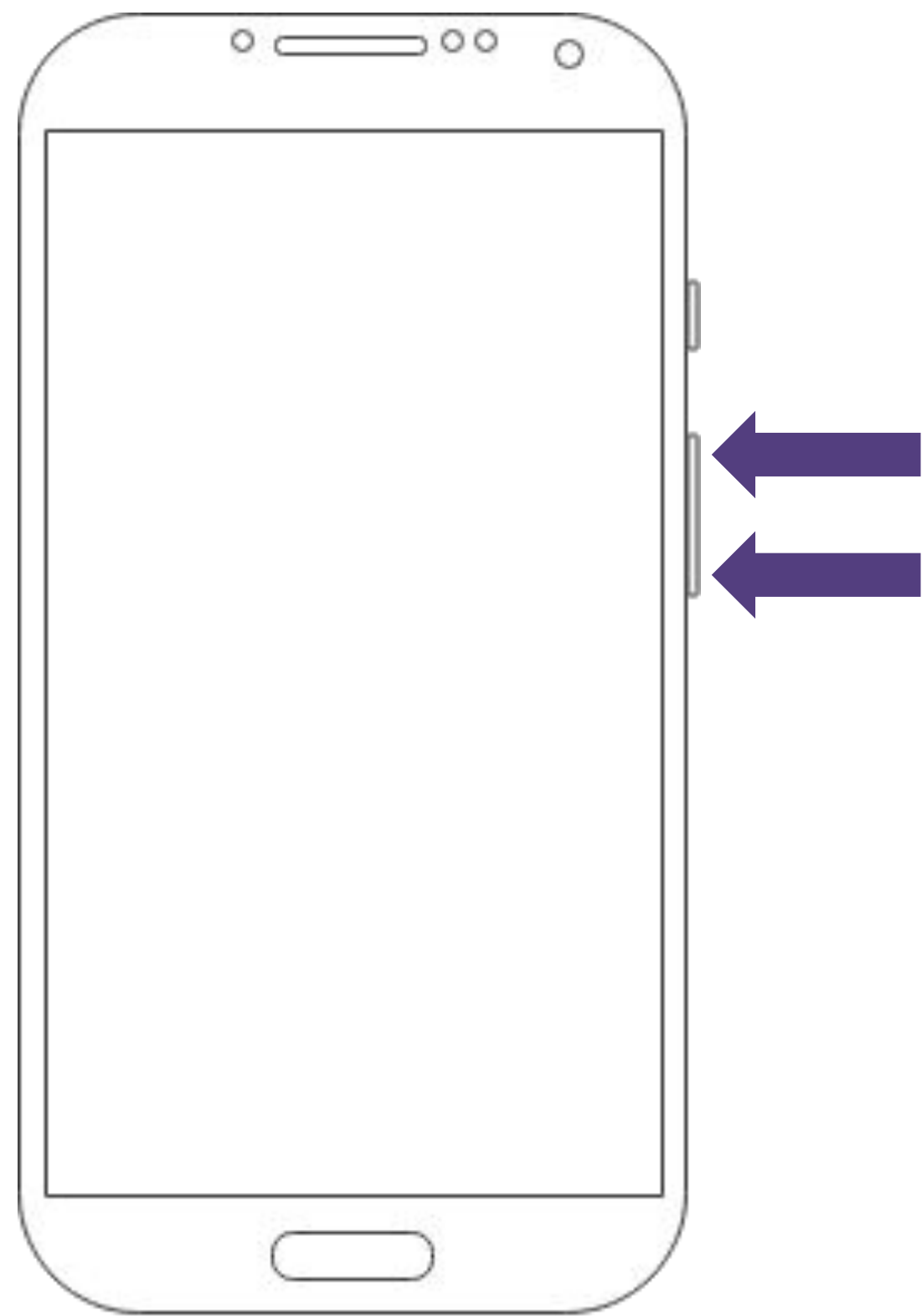
Provê o feedback do que está na tela por áudio.



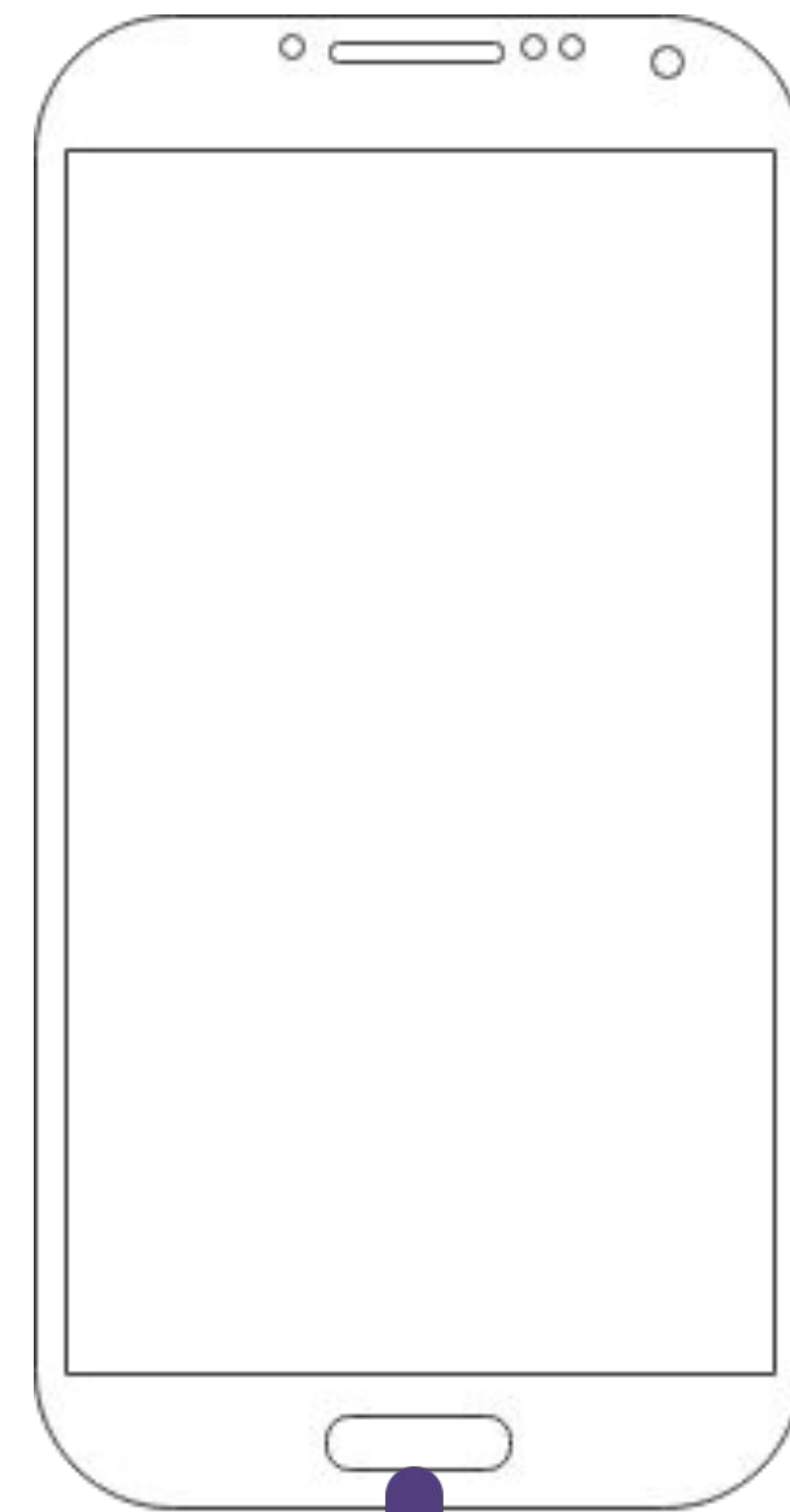
Ativando o Talkback



Ativando o Talkback



Segurar por 3 segundos



Tocar 3 vezes

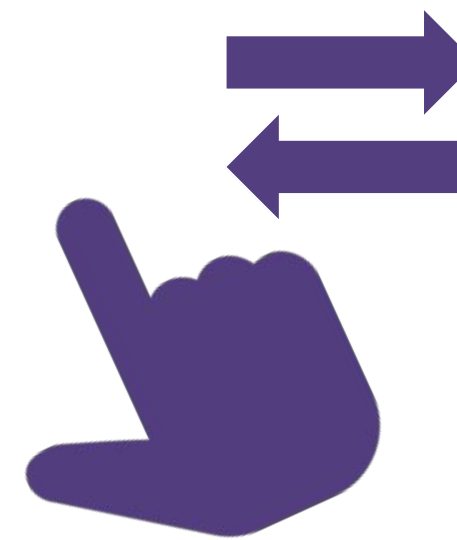
Navegação no Talkback



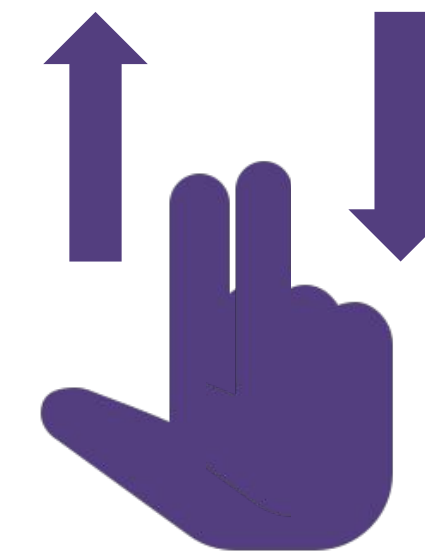
Toque Simples:
Seleção



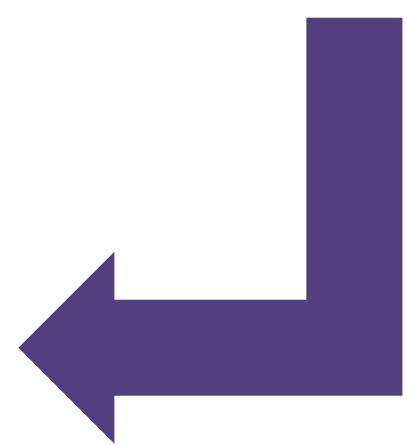
Toque Duplo:
Realiza ação



Navegação



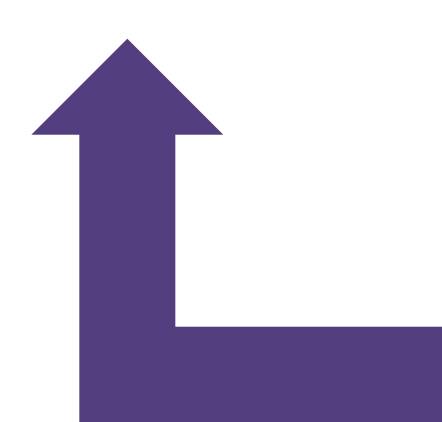
Scroll



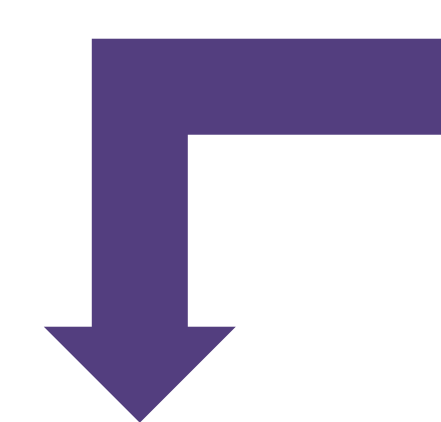
Voltar



Home

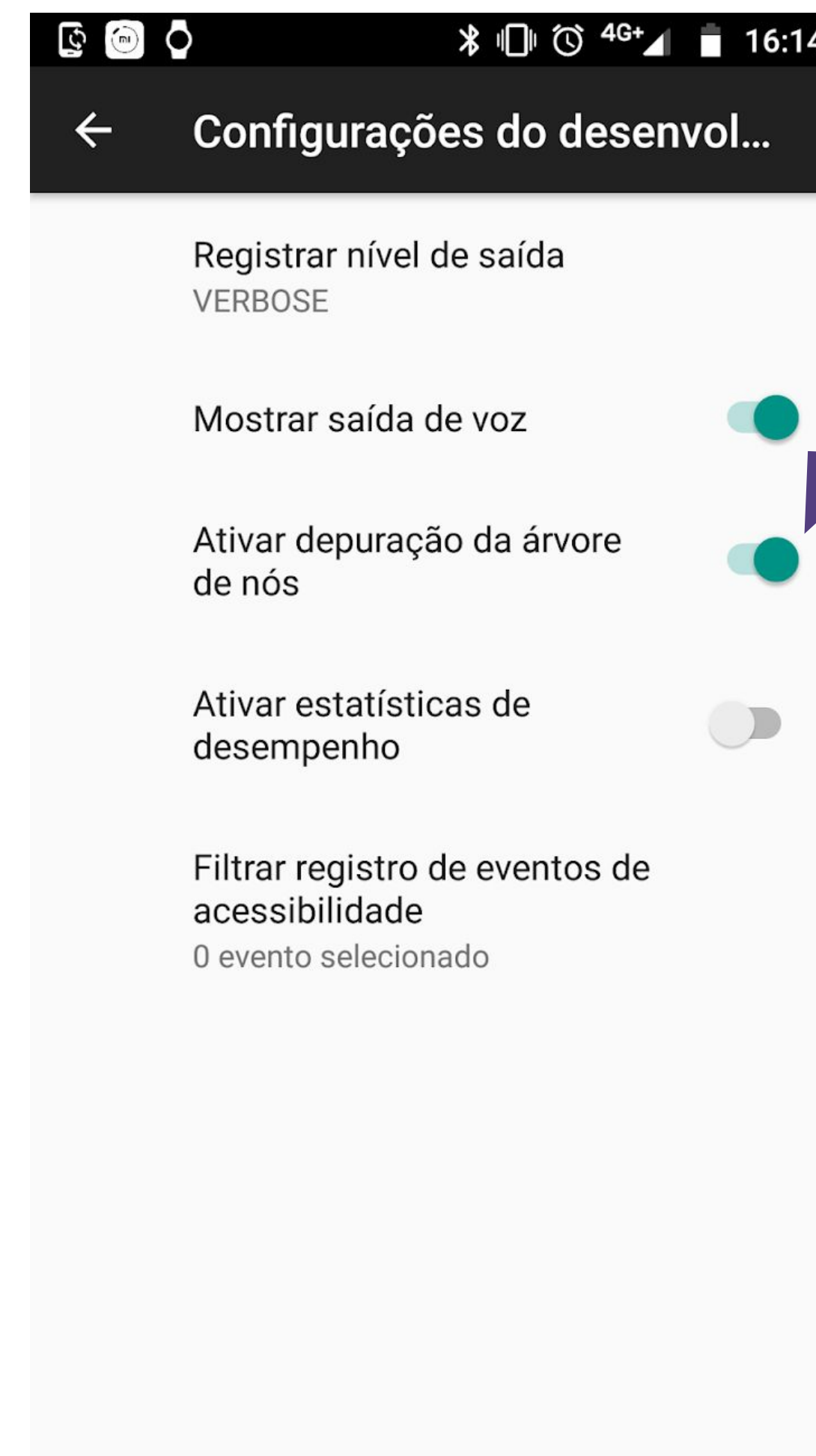
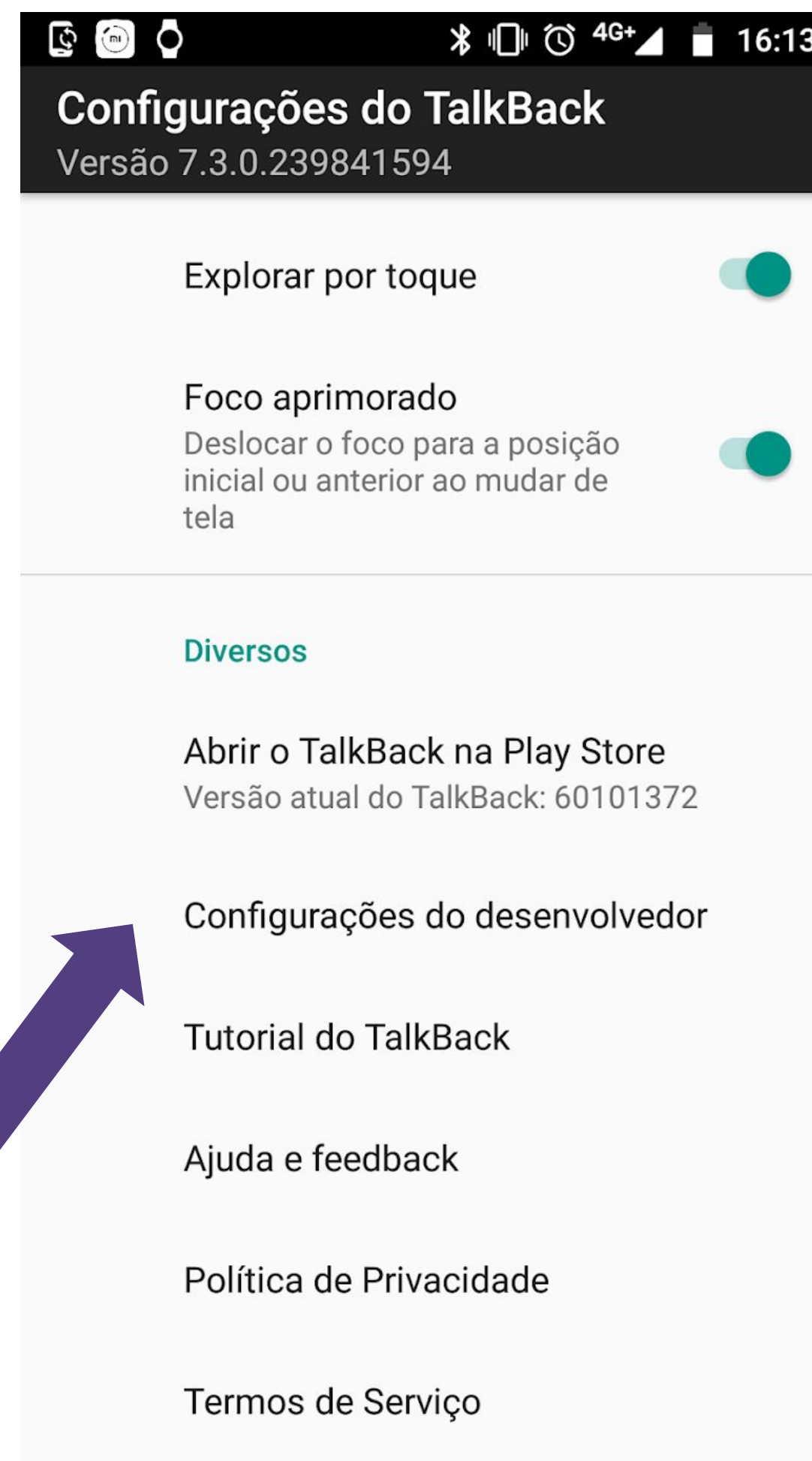
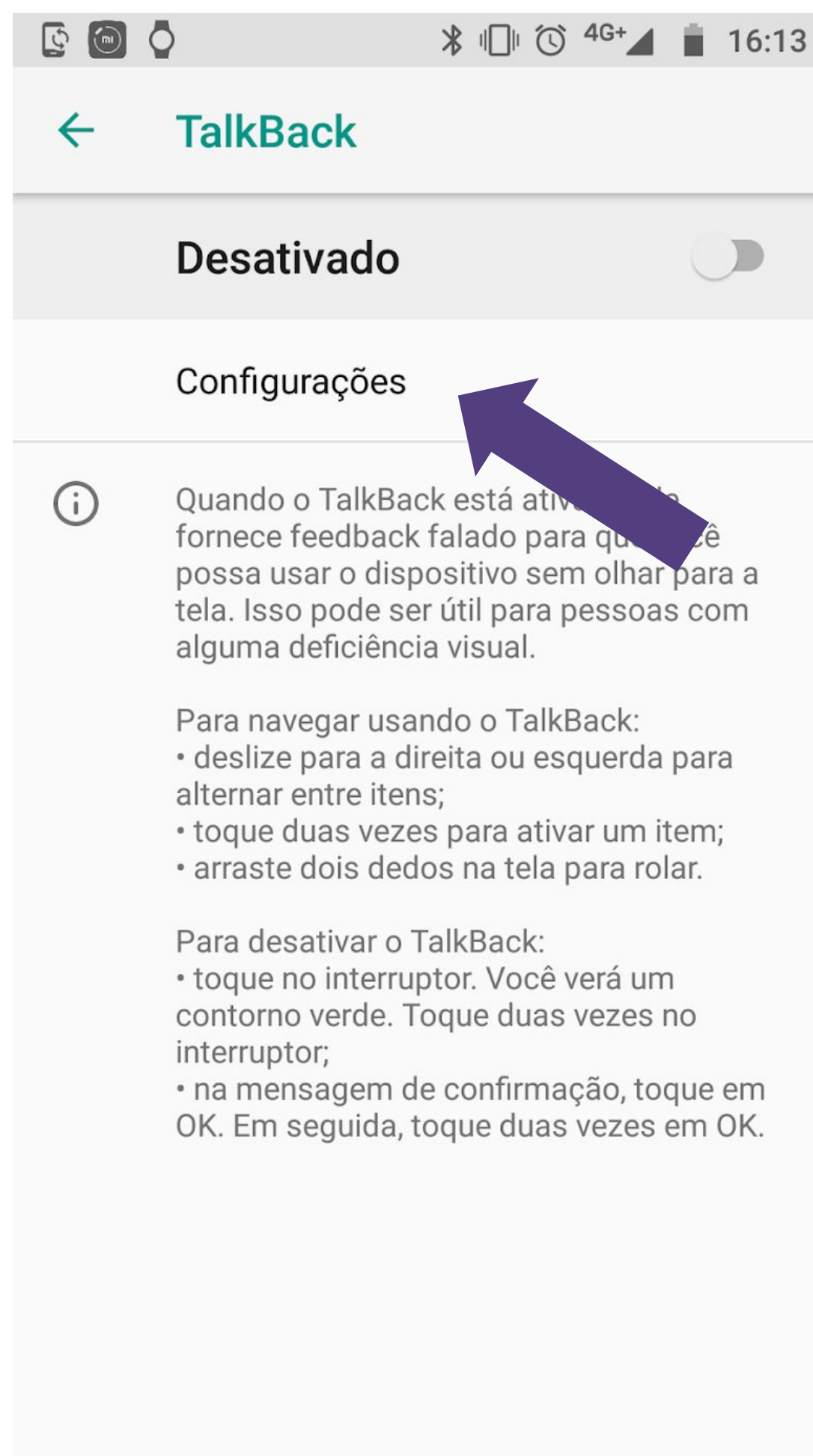


Apps
Recentes



Pesquisa

Dica útil para o Talkback



Dica útil para o Talkback

Não escurecer a tela quando o TalkBack estiver ativado

Abrir o TalkBack na Play Store

Versão atual do TalkBack: 60101372

Configurações do desenvolvedor

Tutorial do TalkBack

Ajuda e feedback

Política de Privacidade

Configurações do desenvolvedor, Na lista, 29

Termos de Serviço





Dica útil para o Talkback

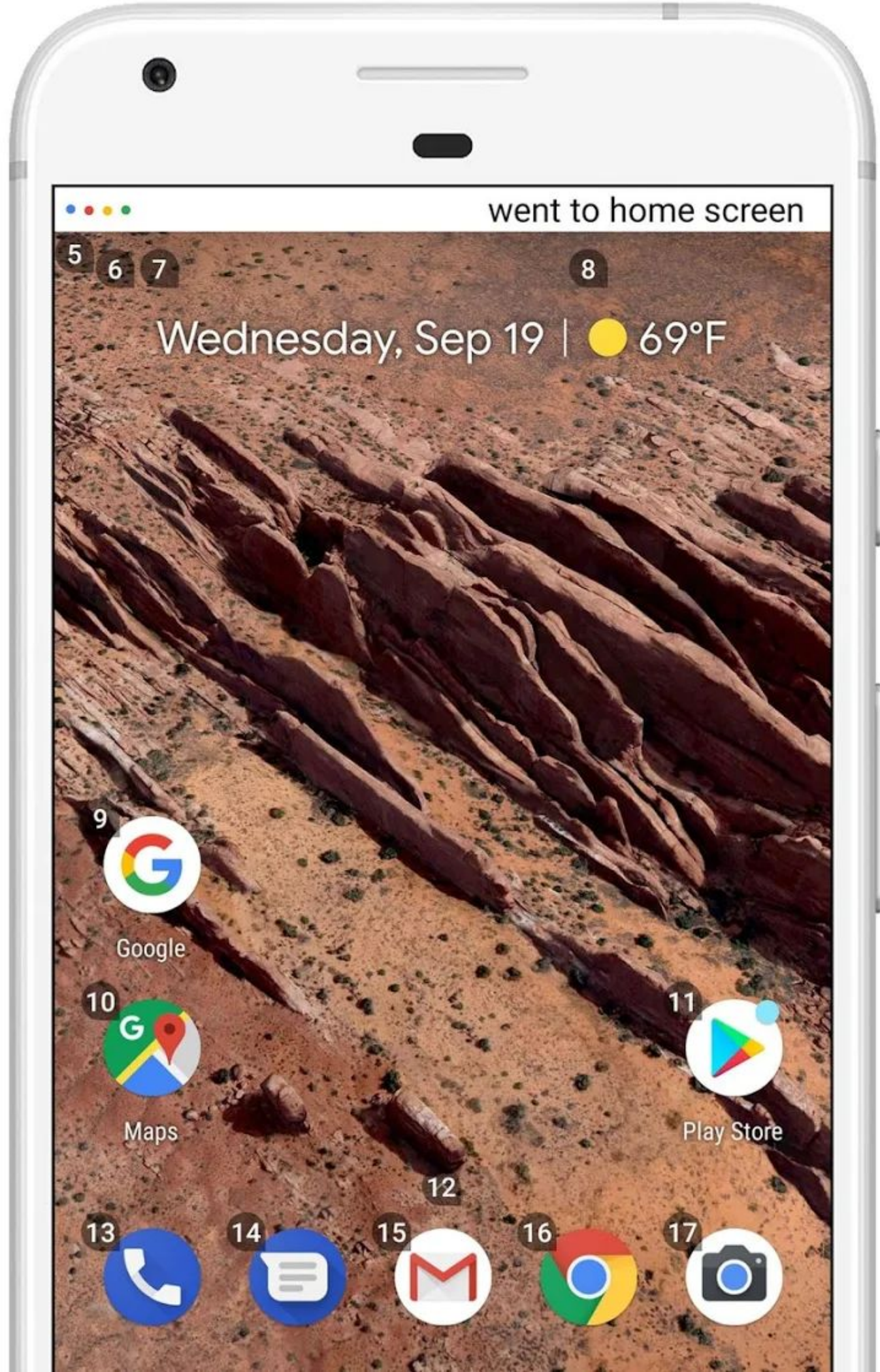
Configurações de desenvolvedor -> Ativar depuração da árvore de nós

Configurações de desenvolvedor -> Registrar nível de saída -> VERBOSE

Gestos -> Definir um gesto para imprimir árvore de nós

```
V/TreeDebug: Window: AccessibilityWindowInfo[title=Ordem de leituraid=289, type=TYPE_APPLICATION, layer
V/TreeDebug: (-2147455521)289.FrameLayout:(0, 0 - 1080, 1920):A
V/TreeDebug: (55035)289.ImageButton:(0, 63 - 147, 210):CD{Navigate up}:FAC:focusable:clickable
V/TreeDebug: (55996)289.TextView:(189, 101 - 583, 172):TEXT{Ordem de leitura}:A:supportsTextLocation
V/TreeDebug: (56957)289.TextView:(382, 505 - 698, 640):TEXT{Primeiro texto}:A:supportsTextLocation
V/TreeDebug: (54074)289.View:(380, 935 - 701, 1499):a:focusable:focused:accessibilityFocused
```

Voice Access



Fonte: <https://engt.co/2kqDBjz>

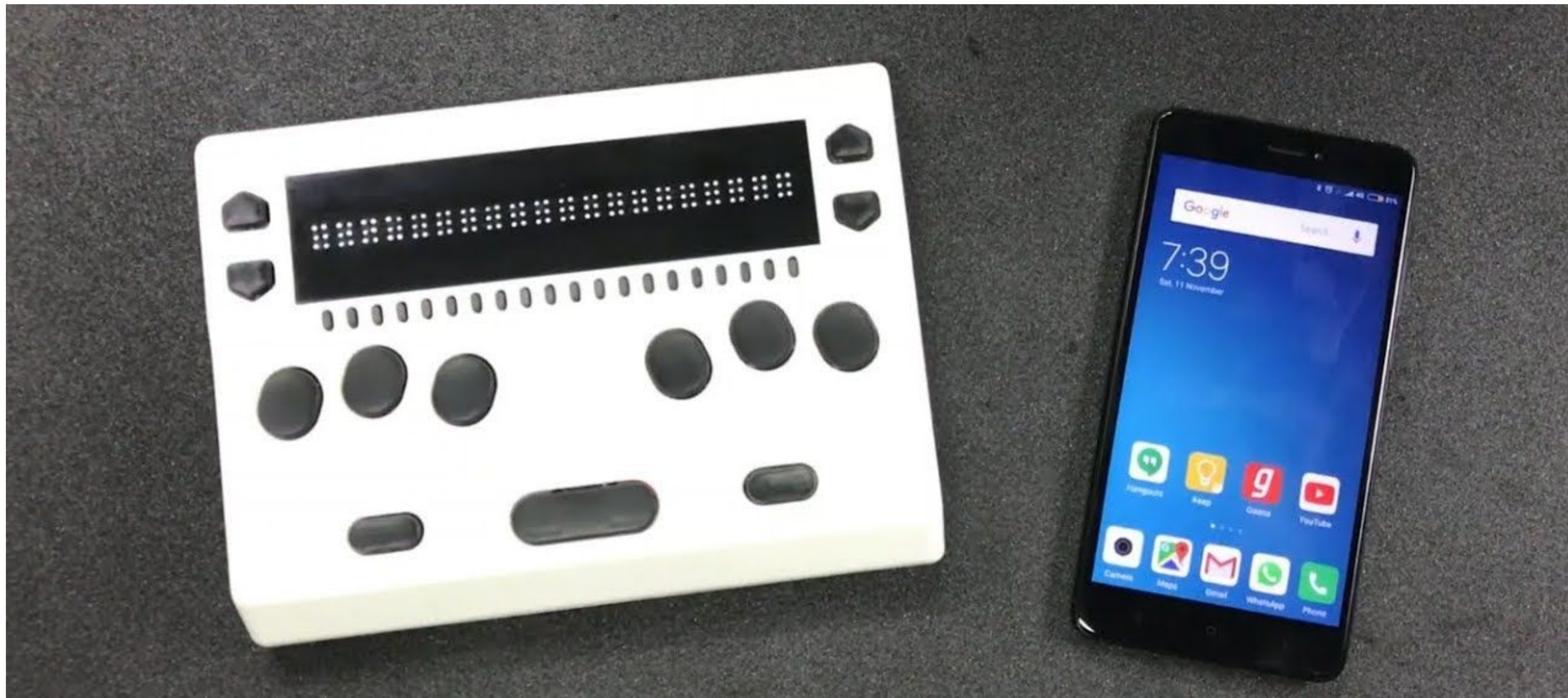
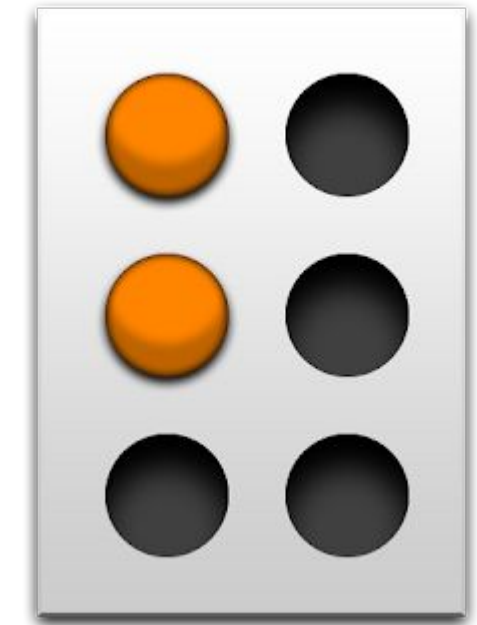
Switch Access



Fonte: <https://bit.ly/2jZ1nmL>

Fonte: <https://bit.ly/2ko8EfZ>

Brailleback



Fonte: <http://innovisiontech.co/>

Diversos outros serviços



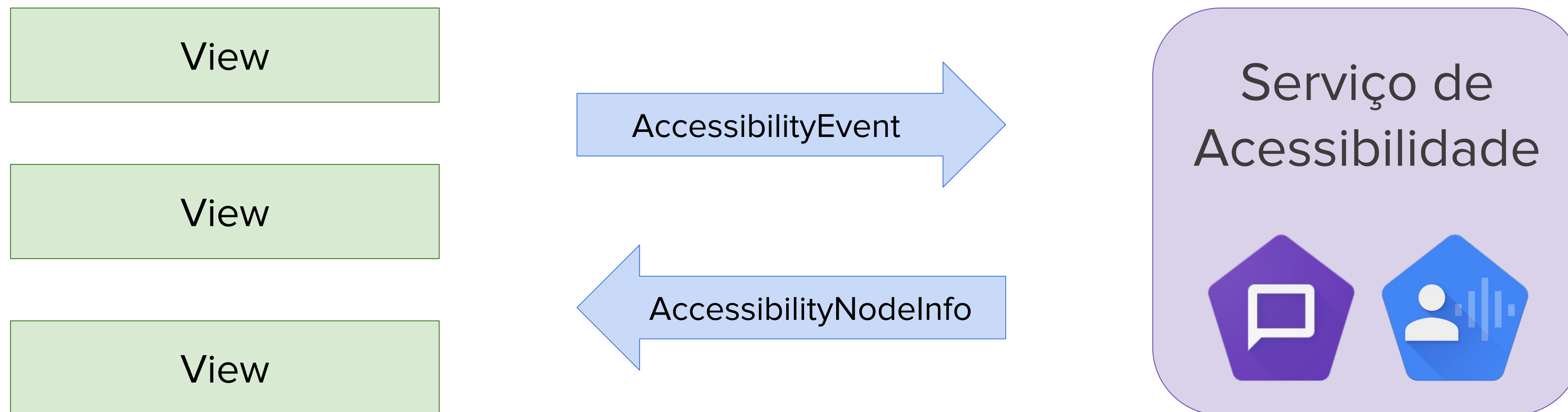
- Ampliação
- Tamanho da fonte/exibição
- Correção/inversão de cor
- Amplificador de som
- Texto em alto contraste





Framework de Acessibilidade

Accessibility Framework



Accessibility Framework

```
V/TreeDebug: Window: AccessibilityWindowInfo[title=nullid=142, type=TYPE_SYSTEM, layer=231000, bounds=Rect(0, 1794 - 1080, 1920), focused=false,
V/TreeDebug: (49122)142.FrameLayout:(0, 1794 - 1080, 1920):A
V/TreeDebug: (35668)142.FrameLayout:(0, 1794 - 1080, 1920):A
V/TreeDebug: (50083)142.FrameLayout:(435, 1794 - 645, 1920):FAC:focusable:clickable
V/TreeDebug: (43356)142.ImageView:(435, 1794 - 645, 1920):CD{Home}:FACL:focusable:clickable:longClickable
V/TreeDebug: (48161)142.ImageView:(141, 1794 - 340, 1920):CD{Back}:FACL:focusable:clickable:longClickable
V/TreeDebug: (51044)142.ImageView:(738, 1794 - 938, 1920):CD{Overview}:FACL:focusable:clickable:longClickable
V/TreeDebug: Window: AccessibilityWindowInfo[title=nullid=141, type=TYPE_SYSTEM, layer=181000, bounds=Rect(0, 0 - 1080, 63), focused=false, acti
V/TreeDebug: (123118)141.FrameLayout:(0, 0 - 1080, 63):A
V/TreeDebug: (193271)141.ImageView:(37, 0 - 100, 63):CD{Google Play Store notification: Google Play Protect is turned on}:A
V/TreeDebug: (134650)141.ImageView:(100, 0 - 163, 63):CD{Android System notification: USB debugging connected}:A
V/TreeDebug: (135611)141.ImageView:(163, 0 - 226, 63):CD{Android System notification: Virtual SD card}:A
V/TreeDebug: (153870)141.FrameLayout:(790, 9 - 838, 54):CD{Wifi signal full.}:A
V/TreeDebug: (158675)141.LinearLayout:(838, 9 - 883, 54):CD{LTE Phone two bars.}:A
V/TreeDebug: (170207)141.LinearLayout:(901, 0 - 926, 63):CD{Battery charging, 100 percent.}:A
V/TreeDebug: (122157)141.TextView:(926, 0 - 1038, 63):TEXT{10:16}:CD{10:16 PM}:A:supportsTextLocation
V/TreeDebug: Window: AccessibilityWindowInfo[title=Ordem de leituraid=289, type=TYPE_APPLICATION, layer=21060, bounds=Rect(0, 0 - 1080, 1920), f
V/TreeDebug: (-2147455521)289.FrameLayout:(0, 0 - 1080, 1920):A
V/TreeDebug: (55035)289.ImageButton:(0, 63 - 147, 210):CD{Navigate up}:FAC:focusable:clickable
V/TreeDebug: (55996)289.TextView:(189, 101 - 583, 172):TEXT{Ordem de leitura}:A:supportsTextLocation
V/TreeDebug: (56957)289.TextView:(382, 505 - 698, 640):TEXT{Primeiro texto}:A:supportsTextLocation
V/TreeDebug: (54074)289.View:(380, 935 - 701, 1499):a:focusable:focused:accessibilityFocused
```

Accessibility Framework

```
ViewCompat.setAccessibilityDelegate(view, object : AccessibilityDelegateCompat() {  
    override fun onInitializeAccessibilityNodeInfo(host: View?, info: AccessibilityNodeInfoCompat?) {  
        info?.isEnabled = true  
        super.onInitializeAccessibilityNodeInfo(host, info)  
    }  
  
    override fun onPopulateAccessibilityEvent(host: View?, event: AccessibilityEvent?) {  
        if (event?.eventType != AccessibilityEvent.TYPE_VIEW_TEXT_CHANGED) {  
            super.onPopulateAccessibilityEvent(host, event)  
        }  
    }  
})
```

Accessibility Framework

- - Todos os widgets suportam nativamente
 - CustomViews devem disponibilizar manualmente
 - Limites da view
 - Descrição
 - Ações suportadas

Boas práticas



Requisitos de acessibilidade



- WCAG 2.1
- GuAMA

2.4.3 - Ordem do foco

[A]

[acessar Critério c](#)

A navegação (a
por elementos
ser sequencial
o conteúdo ap

Nota: utilizar er
1.3.2.

1.4.3 - Contraste (mínimo) [AA]

[acessar Critério de Sucesso 1.4.3](#)

Perceptível
Discernível

Textos devem ter uma relação de
contraste* entre primeiro e segundo
plano de ao menos 4.5:1.

Nota: textos em tamanhos de fontes
maiores (a partir de 18pt ou 14pt bold)
podem ter uma relação de contraste de
3:1.

Nota 2: ver critério completo para
entender relação de contraste.

R01 • **desejável**

Os componentes e informações da interface devem
funcionalidade da aplicação.

[Detalhes sobre R01](#) ▼

R02 • **mandatório**

Os componentes da interface devem ser entendidos

[Detalhes sobre R02](#) ▼

R03 • **mandatório**

Os componentes da interface devem utilizar cores c
de fundo.

[Detalhes sobre R03](#) ▼

R04 • **desejável**

A interface sempre deve oferecer a opção para a ori

[Detalhes sobre R04](#) ▼

R05 • **mandatório**

Não dependa apenas de cores

Description

Let me only say that it fared with him as with the storm-tossed ship, that miserably drives along the leeward land

exceeded the maximum characters 130 / 120

Sim

Description

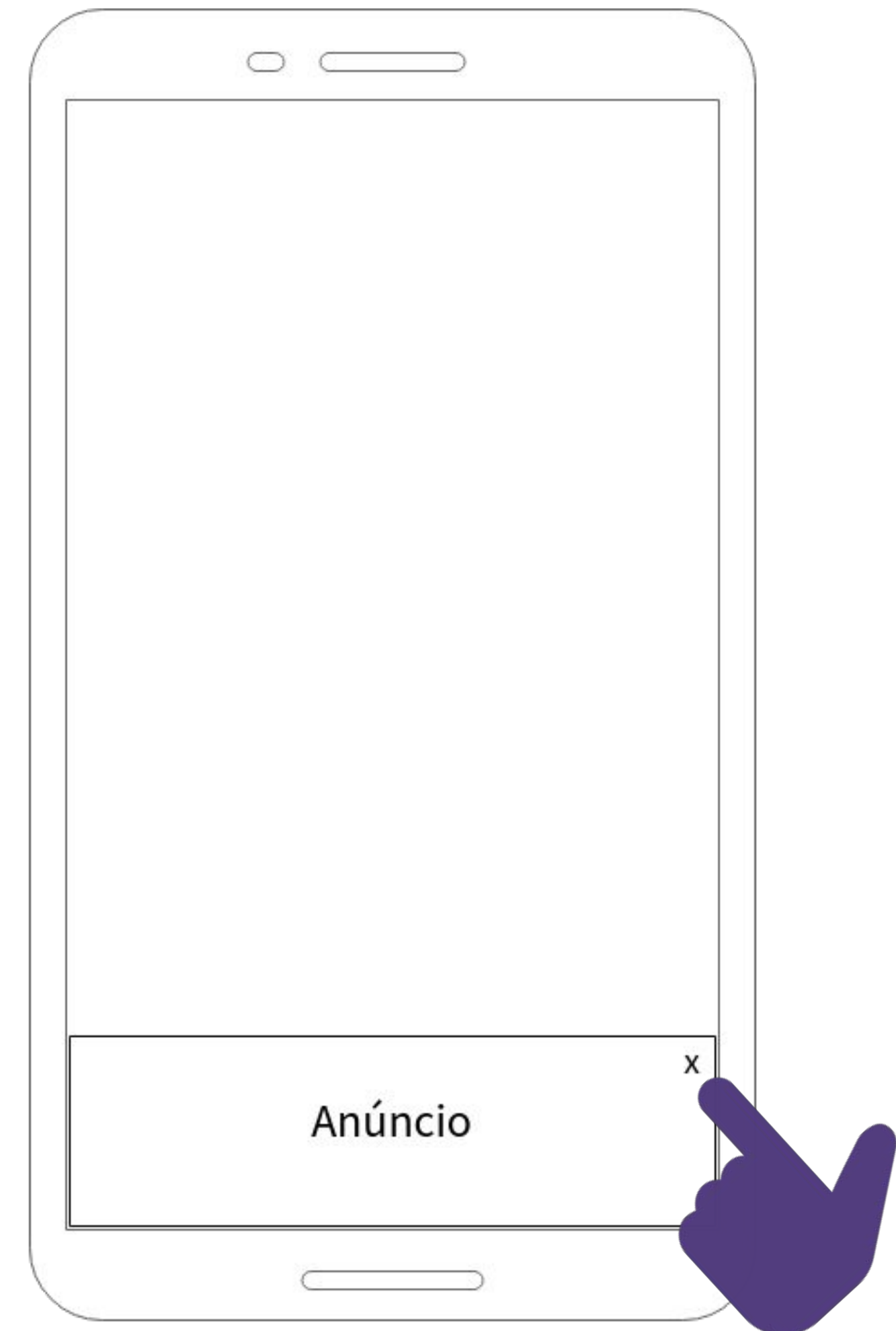
Let me only say that it fared with him as with the storm-tossed ship, that miserably drives along the leeward land

Não

Tamanho mínimo da área de toque

48dp x 48dp

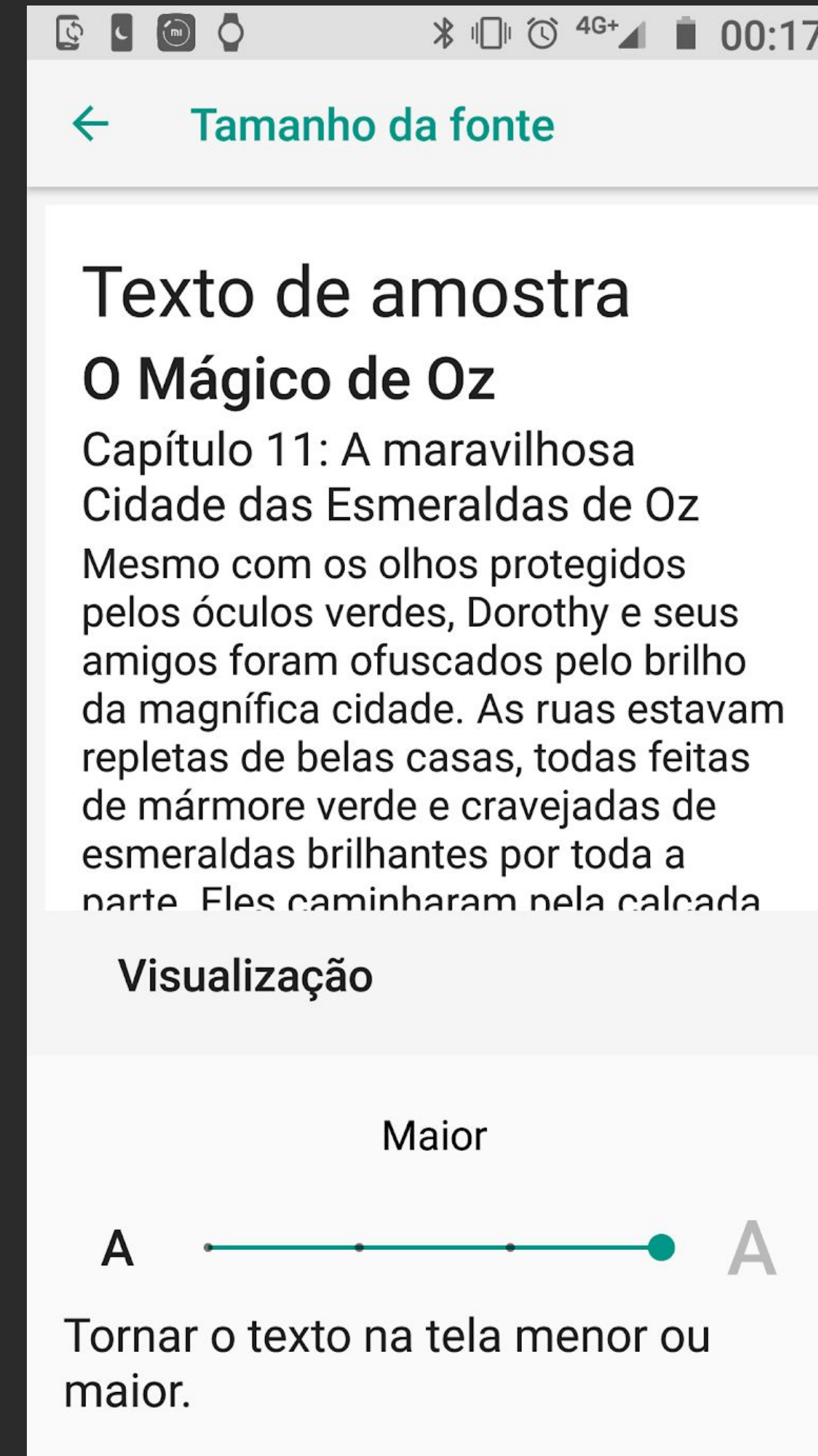
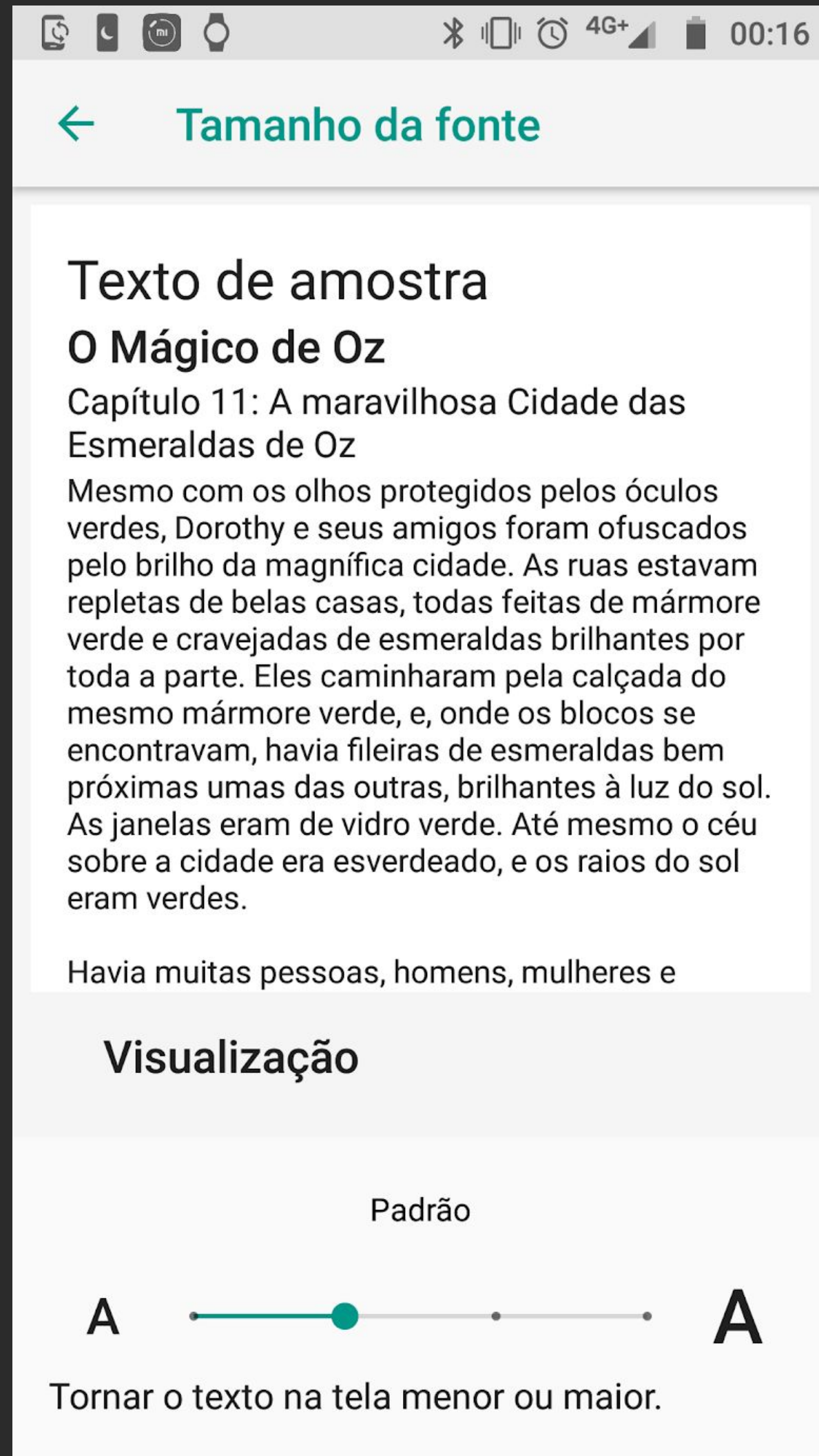
Distância de 8dp



Use SP para tamanho de textos

```
<TextView  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:textSize="14sp"  
    android:text="@string/text" />
```

Use SP para tamanho de textos



Descrição de conteúdo

```
<ImageView  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:contentDescription="@string/accessible_description"  
    android:textSize="14sp"  
    app:srcCompat="@drawable/ic_icon" />
```

Descrição de conteúdo

```
<ImageView  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:importantForAccessibility="no"  
    android:textSize="14sp"  
    app:srcCompat="@drawable/ic_icon" />
```

Quando a imagem é apenas ilustrativa

Descrição de conteúdo

Não indique estado ou tipo de elemento no texto de descrição







```
ViewCompat.setAccessibilityDelegate(ivImageView, object : AccessibilityDelegateCompat() {  
    override fun onInitializeAccessibilityNodeInfo(host: View?, info: AccessibilityNodeInfoCompat?) {  
        info?.className = Button::class.java.name  
        super.onInitializeAccessibilityNodeInfo(host, info)  
    }  
})
```

```
ViewCompat.setAccessibilityDelegate(ivImageView, object : AccessibilityDelegateCompat() {  
    override fun onInitializeAccessibilityNodeInfo(host: View?, info: AccessibilityNodeInfoCompat?) {  
        info?.isHeading = true  
        super.onInitializeAccessibilityNodeInfo(host, info)  
    }  
})
```

Contraste de cores

Garanta um contraste suficiente entre a cor de fundo e a cor do texto

<https://contrastchecker.com>

			Foreground	Background	Ratio
			#00179C RGB(0,23,156)	#E6E6E6 RGB(230,230,230)	10.5
			#6671B0 RGB(102,113,176)	#E6E6E6 RGB(230,230,230)	3.69

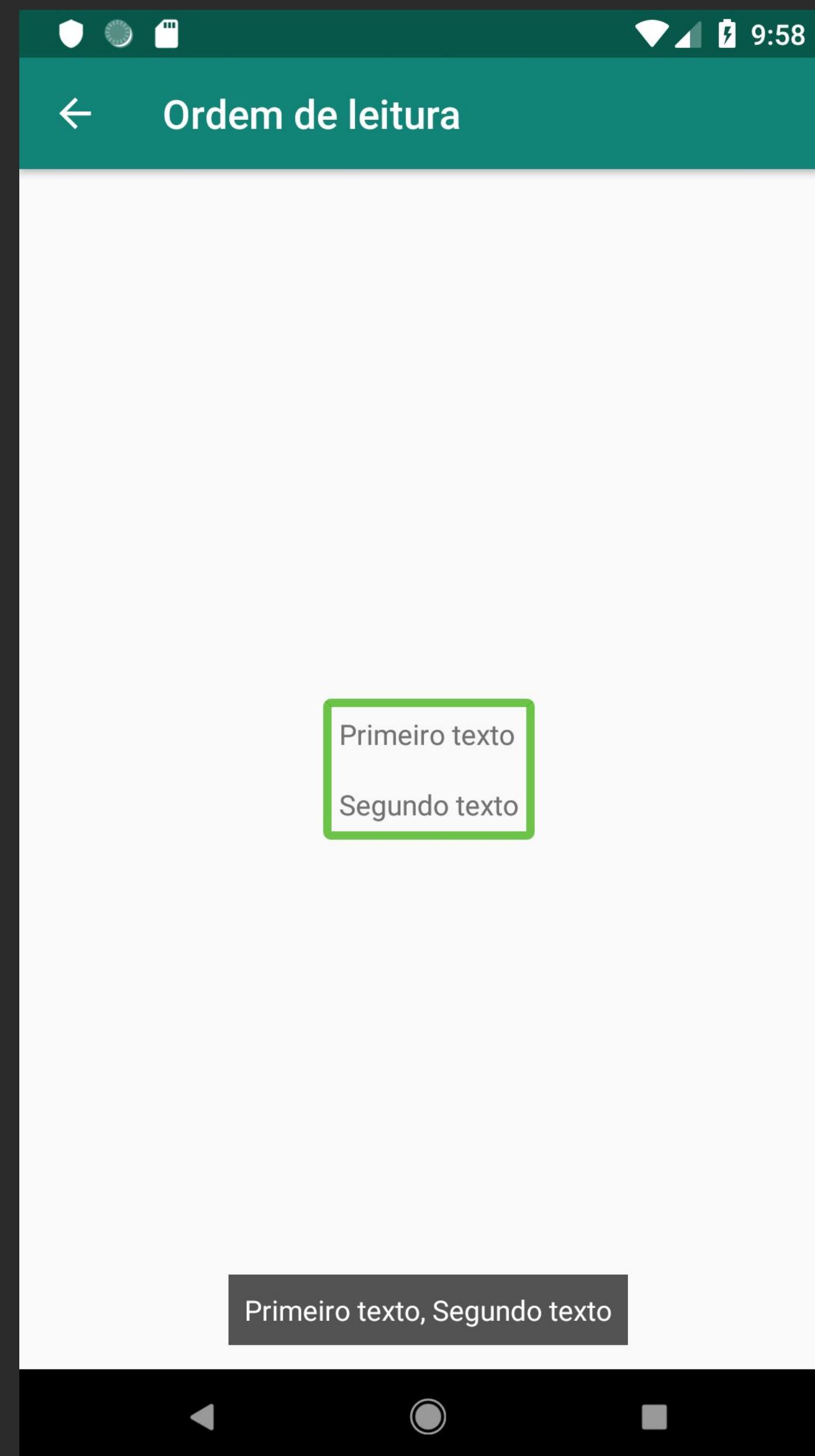
Agrupar leitura

```
<LinearLayout
  android:layout_width="wrap_content"
  android:layout_height="wrap_content"
  android:focusable="true"
  android:importantForAccessibility="yes"
  android:orientation="vertical"
  android:padding="8dp">

  <TextView
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:importantForAccessibility="no"
    android:text="Primeiro texto" />

  <TextView
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="16dp"
    android:importantForAccessibility="no"
    android:text="Segundo texto" />

</LinearLayout>
```



Agrupar leitura

```
<View
  android:layout_width="0dp"
  android:layout_height="0dp"
  android:importantForAccessibility="yes"
  android:focusable="true"
  app:layout_constraintTop_toTopOf="@id/secondView"
  app:layout_constraintBottom_toBottomOf="@id/thirdView"
  app:layout_constraintStart_toStartOf="@id/secondView"
  app:layout_constraintEnd_toEndOf="@id/secondView"/>
```

```
view.contentDescription = "${secondView.text}, ${thirdView.text}"
```



Updates de tela

```
firstView.announceForAccessibility( text: "Notificação recebida")
```

Atenção para a quebra da leitura atual para realizar o anúncio

Dê preferência para Live Regions, que podem ser anunciados de maneira polite

```
ViewCompat.setAccessibilityLiveRegion(firstView, ACCESSIBILITY_LIVE_REGION_POLITE)
```



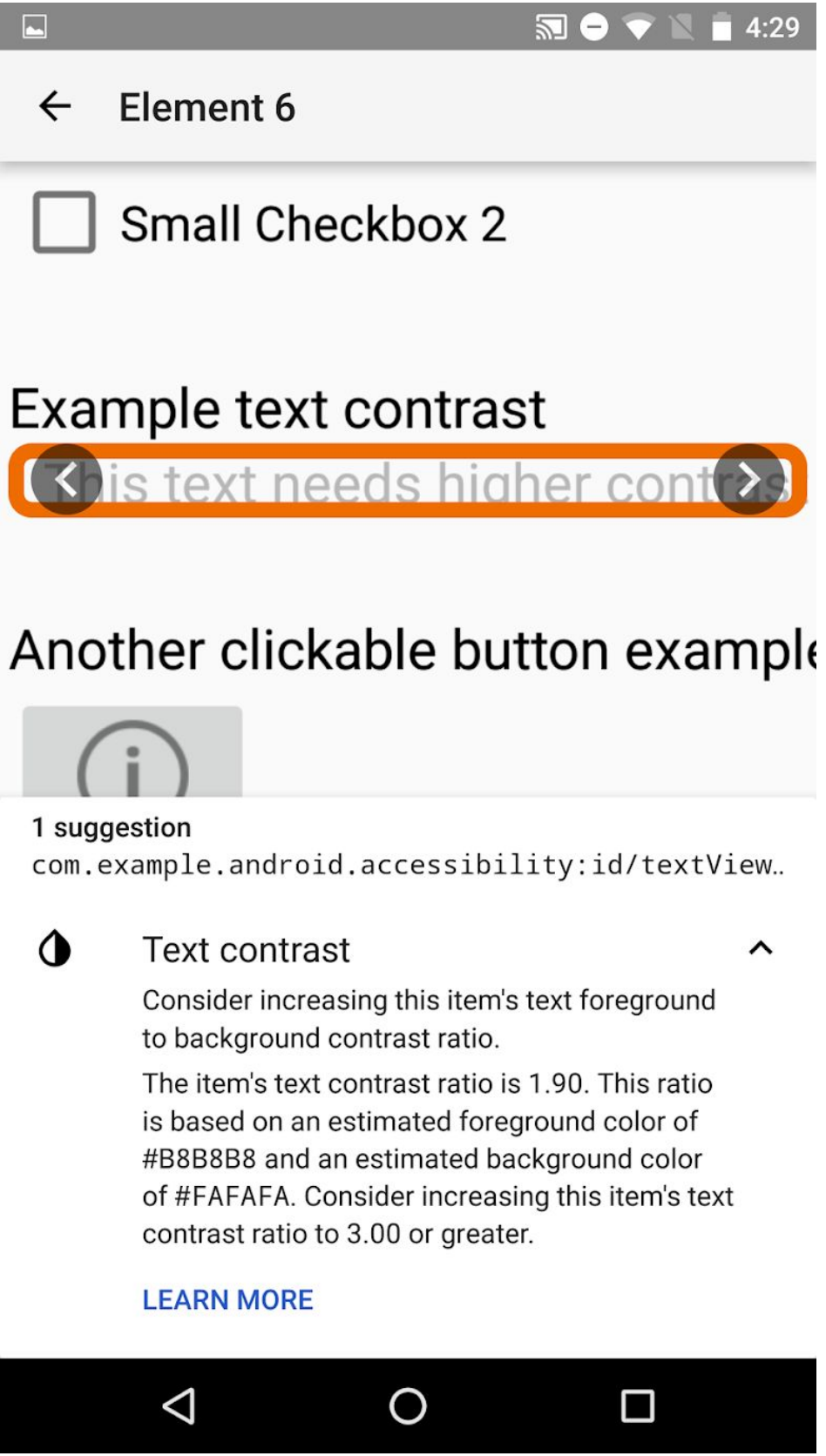
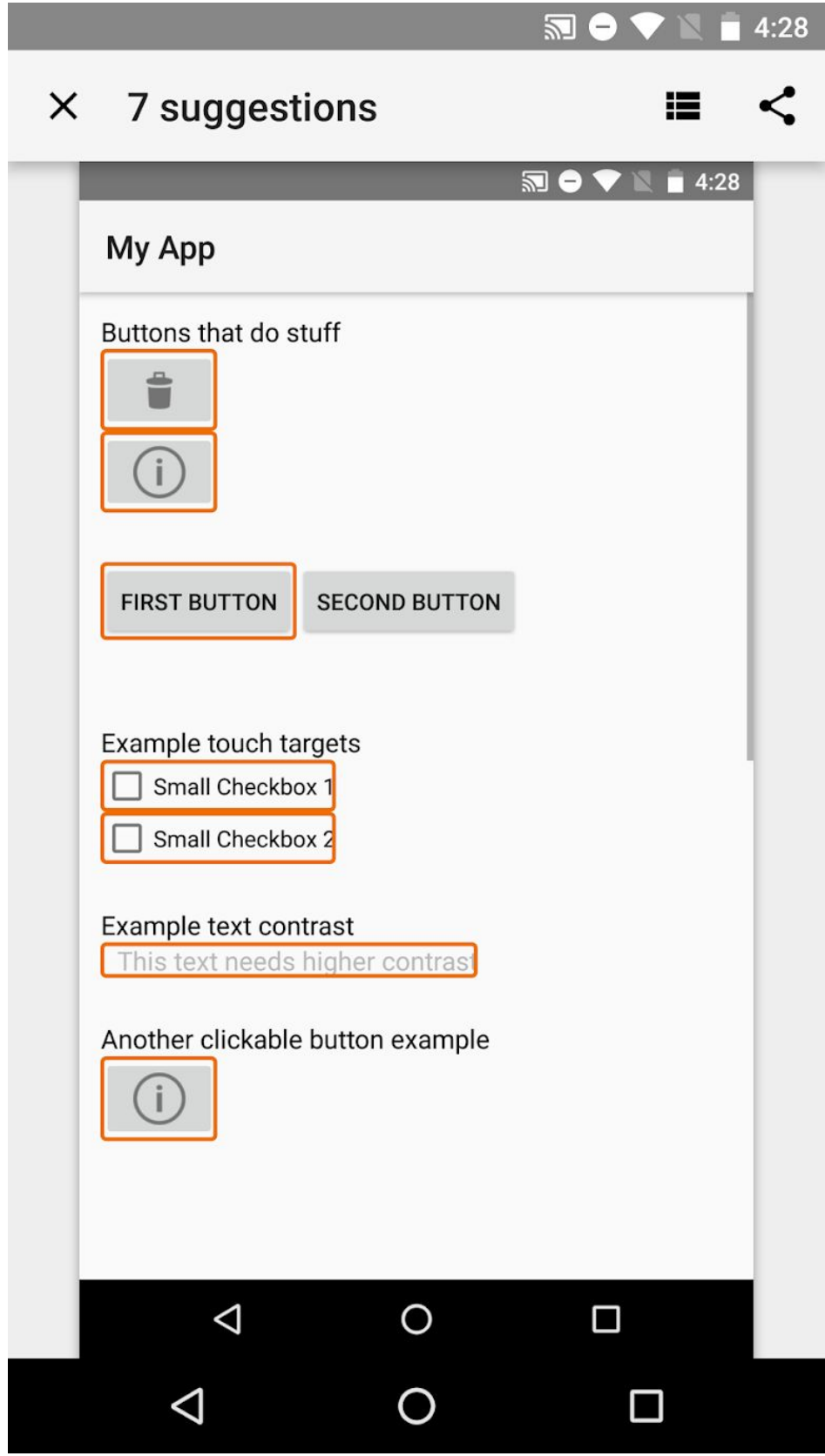
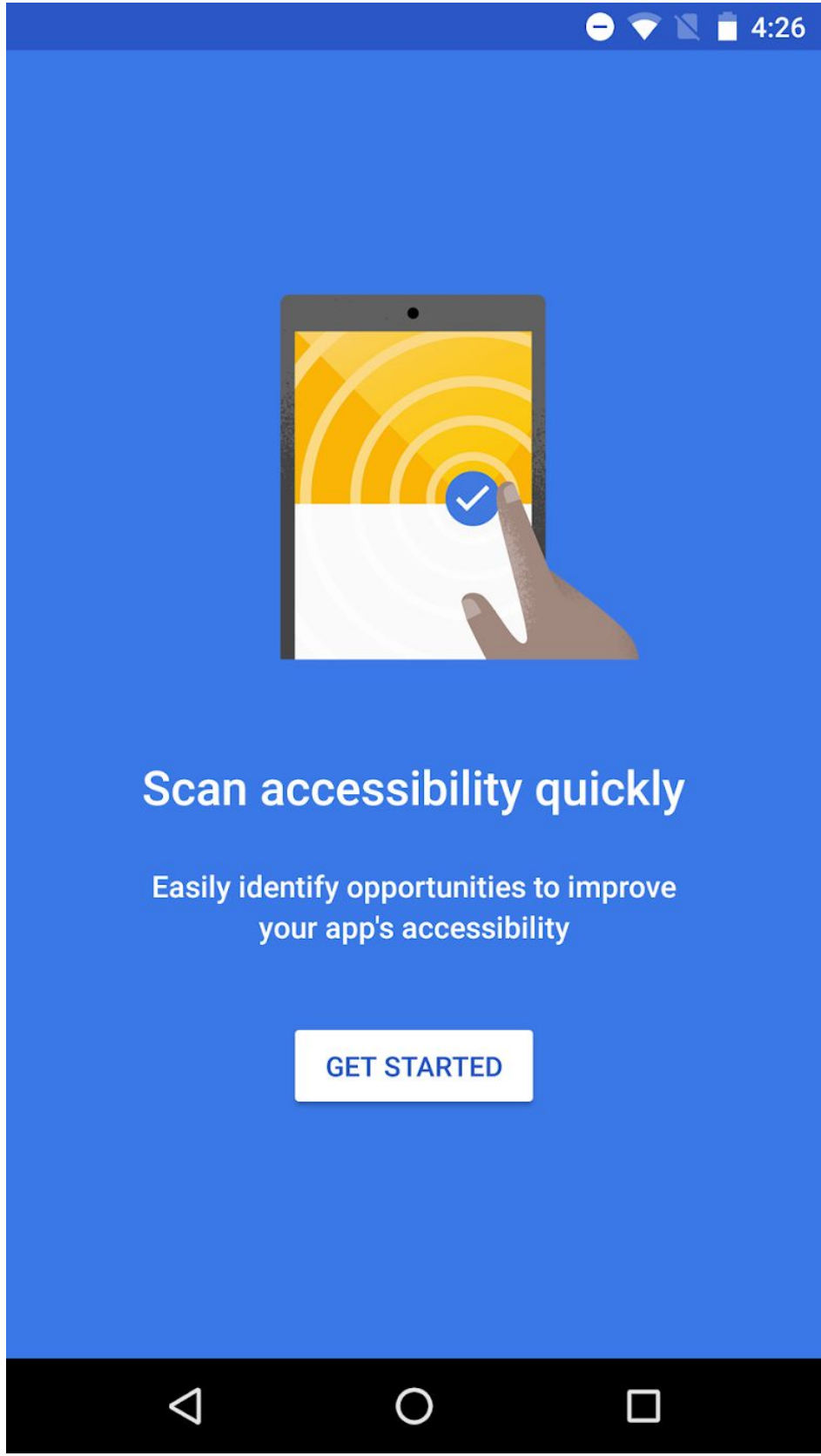
E por onde começar?

Os principais problemas

- - Falta de descrição do conteúdo
 - Área de toque muito pequena
 - Contraste inadequado



Accessibility Scanner



Não deixe para última hora

Nem deixe de fazer



Empatia



Links

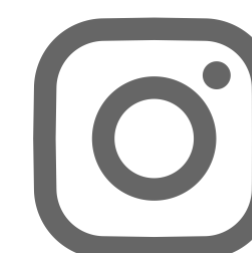
-
- <https://developer.android.com/guide/topics/ui/accessibility>
- <https://material.io/design/usability/accessibility.html#hierarchy>
- <http://acessibilida.de/>
- <https://medium.com/android-dev-br/acessibilidade-para-aplica%C3%A7%C3%B5es-android-b461da054a15>
- <https://estudoinclusivo.com.br/>
- <https://concrete.com.br/2019/03/18/acessibilidade/>
- <http://www.sidi.org.br/guiadeacessibilidade>
- <https://www.microsoft.com/design/inclusive/>

Obrigado!

Perguntas?

Estou nas redes sociais

@diegomalone



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