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The Scottish startup that made animated Kanye rap in his Black Skinhead video

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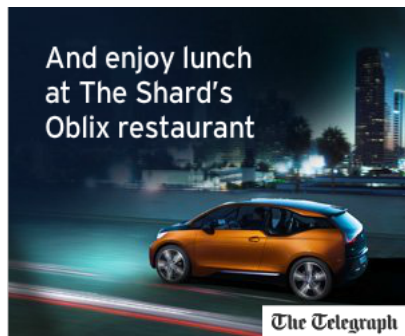
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Kanye West in the interactive Black Skinhead video *Screenshot*

With just days to go until deadline, the facial animations for Kanye West's interactive *Black Skinhead* music video were still unfinished.

The animated version of the infamous hip hop artist needed to convincingly convey the emotional intensity of the lyrics. To achieve this, animated Kanye's face and lips had to move like real-life Kanye would.



Late on a Friday afternoon in early June, Scottish startup Speech Graphics (<http://www.speech-graphics.com/>) got a call from Kanye's record label Def Jam Records.

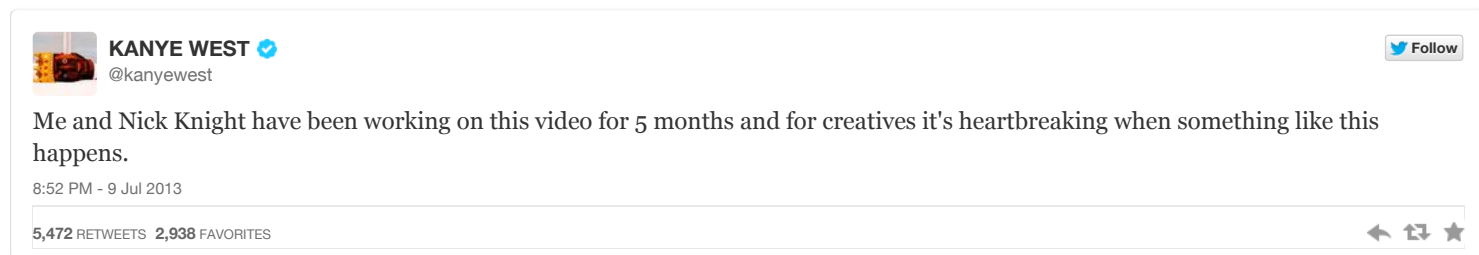
CEO and cofounder Gregor Hofer took the call. The deadline he was given was the following Tuesday, just days away.

"We didn't [actually] receive the assets until Sunday night," he tells [Wired.co.uk](http://www.wired.co.uk). "We basically had to work for 36 hours straight".

When the video leaked in early July, Kanye tweeted

(<https://twitter.com/kanyewest/statuses/354689474845872128>) that he and director Nick Knight had been working on the video for five months.

Why was a two-year-old startup based in Edinburgh getting a last-minute call from Def Jam Records, asking them to help animate Kanye West's face?



Hofer declines to speculate as to why they ended up in such a rush, but the question remains: why was a two-year-old startup based in Edinburgh getting a last-minute call from Def Jam Records, asking them to help animate Kanye West's face?

The simple answer: Speech Graphics is the only company that could do it in time.

"David Bennett, the facial animation lead on *Avatar* (<http://www.wired.co.uk/magazine/archive/2010/01/features/the-creation-of-avatar>), recommended us," says Hofer. "He told [Def Jam] the only way we can get this done in this time frame is with Speech Graphics."



Speech Graphics Multilingual Voice-Driven Lip Sync *Speech Graphics*

Hofer's company, cofounded with CTO Michael Berger, specialises in something called "audio-driven animation".

Normally animated speech would be done with a combination of motion capture (<http://www.wired.co.uk/news/archive/2012-12/10/the-hobbit-motion-capture>) for general movements and manual animation to get the mouth exactly right. It's a time-consuming process, and time is the one thing that nobody had.

Speech Graphics, on the other hand, uses algorithms to automatically convert speech audio, from any language, into facial movements. It's this technology that allowed the animations to be completed so quickly.

"The face has 42 muscles," Hofer explains. "Our [machine-learning] algorithm has a model of how these muscles should move to produce sounds."

Their algorithms break down a piece of audio into its constituent sounds and then matches those sounds to facial muscle movements, which are finally mapped onto a 3D facial model.

"The complicated part is [that] you have different sounds following each other and influencing each other," says Hofer. "[Also] each face behaves a little bit differently. The way your muscles and facial structure behaves is different [to that of another person]. It's subtle, but it's important to get that right."

In Kanye's case, they also had to account for gold grills on his teeth. They had comparatively little audio to work with -- they were sent the vocal track for the *Black Skinhead* and a 3D model of Kanye's face.

"We had three to four people working [on the animation]," says Hofer, who says that they used contractors in the US to allow the team to get sleep while the others worked. The Edinburgh team -- just five permanent staff -- would clock off, and their contractors in the US would clock on. "Once [they] delivered, we could keep working here."

The result of that hard work can be seen at kanyewest.com (<http://www.kanyewest.com>) -- Hofer's team is responsible for the lower half of Kanye's face, the complicated area below the eyes that make or break animated speech, or rapping in this case.

Speech Graphics was founded at the end of 2010 while Hofer and Berger were speech technology PhD students at Edinburgh University. They officially launched in March 2012 and got their first contracts later that year. Though the company is small, Hofer says that they employ a larger network of up to 40 contractors on larger projects, which is usually animation for games -- they're currently working with Warner Brothers on a game due for release in 2014.



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So what does Hofer, a Daft Punk fan, think of *Black Skinhead*? "It's really good, I like it." The rest of the *Yeezus* album is less his style, however. "It's ok, yeah."

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