



Stag User Manual

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Purpose of Stag

Stag is a tool for *audio steganography*, which is the art of hiding something in a seemingly ordinary piece of sound. It is intended for anyone who wants a way to hide a secret message in sound, for whatever reason. In an environment where the user cannot guarantee privacy (such as a group message forum), Stag can be something they (the *sender*) can use to secretly communicate with the intended target (the *receiver*), all while everyone else in the group message forum thinks it's just an ordinary sound file.

While this desktop app might have cybersecurity potential in the future, as of now it lacks the bells and whistles necessary for an entire business to utilize. As of now, it is more of a proof-of-concept.

UI Navigation Guide



Overview

Each relevant group of buttons and text fields are segmented from each other and labelled in the form of instruction steps. Step 4 is initially hidden from the user's view because having a blank output before the user provides any input is both pointless and distracting.

To create your own sound file with a secret message, you would use the app in Encode mode. To read the secret message of a sound file that another user sent you, you would use the app in Decode mode.

The image displays two screenshots of the MATLAB App interface, illustrating the workflow for encoding and decoding a secret message.

Top Screenshot (Encode Mode):

- Step 1:** "Do you wish to encode or decode a file?" with a toggle switch set to "Encode".
- Step 2:** "Choose a sound file to cover the secret message with." with a "Choose File..." button and a "Selected File:" field.
- Step 3:** "Type your secret message." with a "Secret message:" text field (placeholder: "(must be alphanumeric)") and an "Encode" button.
- Bottom Bar:** "Encode" and "Decode" tabs, with "Encode" selected.

Bottom Screenshot (Decode Mode):

- Step 1:** "Do you wish to encode or decode a file?" with a toggle switch set to "Decode".
- Step 2:** "Choose a sound file to cover the secret message with." with a "Choose File..." button and a "Selected File:" field containing "rickroll.wav".
- Step 3:** "Type your secret message." with a "Secret message:" text field containing "HELLO" and an "Encode" button.
- Step 4:** "Save the encoded file to your computer." with a "Save As..." button.
- Output:** A spectrogram titled "Spectrogram of Encoded File" showing the frequency spectrum of the encoded message. The x-axis is "Time" (0 to 2.5) and the y-axis is "Frequency" (19k to 20k). The spectrogram displays the word "HELLO" in a yellow, stylized font against a blue background.
- Bottom Bar:** "Encode" and "Decode" tabs, with "Decode" selected.
- Reset Button:** A red "Reset" button is located at the bottom right.

Instructions for the Spectrogram:

You can drag the graph horizontally to shift the view left and right. Scroll to zoom in/out. If it's unresponsive, click on the graph once and try again. If you're having trouble zooming in/out, drag the graph a little bit and try again.

UI Navigation Guide



Switching between Modes

To switch between Encode mode and Decode mode, you can either click on the toggle switch in step 1 or click on either tab on the bottom-right corner of the window.

Fair warning – Switching from one mode to another will erase whatever input you put down.

1): Do you wish to encode or decode a file?

Encode > ☒ < Decode

2): Choose a sound file to cover the secret message with.

Choose File... Selected File: rickroll.wav

3): Type your secret message.

Secret message: HELLO

Encode Decode

4): Save the encoded file to your computer.

Spectrogram of Encoded File

You can drag the graph horizontally to shift the view left and right. Scroll to zoom in/out. If it's unresponsive, click on the graph once and try again. If you're having trouble zooming in/out, drag the graph a little bit and try again.

Save As... Reset

1): Do you wish to encode or decode a file?

Encode > ☒ < Decode

2): Choose the encoded sound file you want to decode.

Choose File... Selected File: hello.wav

The spectrogram might not plot immediately. Please wait.

Encode Decode

3): View the secret message.

Spectrogram of Encoded File

You can drag the graph horizontally to shift the view left and right. Scroll to zoom in/out. If it's unresponsive, click on the graph once and try again. If you're having trouble zooming in/out, drag the graph a little bit and try again.

Reset

UI Navigation Guide



Encode Mode

To create your own encoded audio file, Stag only needs two things:

- a .wav file that supports a sampling rate of 44100 Hz or more
- a capitalized alphanumeric text message (A-Z, 0-9)
 - (the text field also accepts periods, commas, and question marks.)

Whenever you're ready, press the green 'Encode' button to generate the preview. If you're satisfied with it, you can either choose to save the encoded file as a .wav file or press the red 'reset' button to clear your progress.

MATLAB App

1): Do you wish to encode or decode a file?

Encode > ☐ < Decode

2): Choose a sound file to cover the secret message with.

Choose File... Selected File:

3): Type your secret message.

Secret message:

Encode

Encode Decode

MATLAB App

1): Do you wish to encode or decode a file?

Encode > ☐ < Decode

2): Choose a sound file to cover the secret message with.

Choose File... Selected File: rickroll.wav

3): Type your secret message.

Secret message:

Encode

Encode Decode

4): Save the encoded file to your computer.

Spectrogram of Encoded File

You can drag the graph horizontally to shift the view left and right. Scroll to zoom in/out. If it's unresponsive, click on the graph once and try again. If you're having trouble zooming in/out, drag the graph a little bit and try again.

Save As...

Reset

UI Navigation Guide



Decode Mode

To view the secret message within an encoded audio file, switch to Decode mode.

The only thing Stag needs from you is the file itself.

When you're ready to view the secret message, press the blue 'Decode' button.

MATLAB App

1): Do you wish to encode or decode a file?

Encode > ☒ < Decode

2): Choose the encoded sound file you want to decode.

Choose File... Selected File:

Decode

Encode Decode

MATLAB App

1): Do you wish to encode or decode a file?

Encode > ☐ < Decode

2): Choose a sound file to cover the secret message with.

Choose File... Selected File: rickroll.wav

3): Type your secret message.

Secret message:

Encode

4): Save the encoded file to your computer.

Spectrogram of Encoded File

You can drag the graph horizontally to shift the view left and right. Scroll to zoom in/out. If it's unresponsive, click on the graph once and try again. If you're having trouble zooming in/out, drag the graph a little bit and try again.

Save As...

Reset

Encode Decode



Limitations/Things to Consider

- Plotting spectrograms is a bit resource-intensive. Each character takes up 0.5 seconds, so we recommend that you keep the secret message at a reasonable size when encoding an audio file.
- Always check if the sound file you chose is longer than the secret message you want to put in it. As of now, Stag does not have a way to handle such a user error, so the task will fail if the secret message is longer than the cover audio.
- In Decode mode, if it's taking a while to see the spectrogram, please be patient. For reference's sake, a 5-minute audio file took about 45 seconds to plot on the developer's machine.