MewRecorder: Simplified Code Structure and Logic Summary (with OptiTrack)

Overview

MewRecorder.mlapp is a MATLAB App Designer GUI for synchronized **ultrasound (Telemed EchoWave II)**, **audio**, and now **OptiTrack motion tracking** recording. It captures and synchronizes multimodal data, then optionally converts ultrasound `.tvd` files into combined `.mp4` video using **FFmpeg**.

Main Functions

1. Initialization (`startupFcn` → `initialize`)

- Sets up UI and verifies MATLAB version.
- Detects and connects to EchoWave II (Telemed ultrasound).
- Initializes audio device.
- Checks FFMPEG installation.
- Prepares optional OptiTrack recording control (if enabled).
- Sets app status: `inactive`, `ready`, or `busy`.

Key calls: - `DetectEchoWave()` → Connect to EchoWave. - `selectAudioDevice()` → Configure audio input. - `CheckIfAudioDeviceSettingSupported()` → Validate sampling rate and channel count.

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2. Recording Workflow

(a) Start Recording (`StartRecordButtonPushed`)

1. Checks for active EchoWave and probe (if ultrasound selected).
2. Enables optional **OptiTrack recording** (future logic can start a NatNet or Motive stream here).
3. Sets state to `busy` and generates timestamped filename via `GenFilename()`.
4. Starts **audio recorder** using `audiorecorder`.
5. Starts **Telemed recording** using EchoWave commands.
6. Continuously updates UI (record duration, lamp signals) until:
7. Stop pressed, OR
8. Duration/timeout reached.

(b) Stop Recording (`Bn_StopPushed`)

- Stops audio, EchoWave, and (if applicable) OptiTrack recording.
- Saves `.wav` (normalized audio), `.tvd` (ultrasound cine), and optionally OptiTrack data file.
- Updates `_MewRecorder.log` with timestamps, filename, and annotation.

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3. Data Conversion

Menu → Tools → Convert TVD to MP4 (via AVI)

- Converts all recorded `.tvd` ultrasound files using EchoWave CLI.
- Extracts synchronized audio from `.wav` via sync pulses.
- Merges audio and video with FFmpeg if installed.

Core functions: - `ConvertTVDtoVideo()` → Convert `.tvd` to AVI/MP4. - `TrimTelemedAudio()` → Aligns Telemed sync channel. - `ffmpegCombineVideoAudio()` → Combines audio/video.

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4. OptiTrack Integration

New Component: `Ck_ifRecordOptitrack` (checkbox)

- Enables or disables OptiTrack motion tracking recording.
- Intended to synchronize with audio and ultrasound capture.
- Future versions may call external MATLAB or Python scripts to record via **NatNet SDK** or **Motive API**.
- Placeholder hook exists in the recording logic to extend later.

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5. Utility Functions

Function	Description
`appSetStatus`	Updates GUI state.
`do_log`	Appends session info (filename, times, notes).
`CheckOutputFolderAccess`	Validates output folder permissions.
`FindTelemedEchoWavePath`	Locates EchoWave installation.
`hasFFmpegInstalled`	Checks if FFmpeg is in PATH.
`NextAvailableFileName`	Avoids overwriting files.

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6. Key UI Components

Element	Purpose
Record Telemed Ultrasound	Enable ultrasound video acquisition.
Record OptiTrack	Enable OptiTrack 3D motion tracking (new).
Normalize Audio	Normalize waveform before saving.

Element	Purpose
Start / Stop Buttons	Begin and end multimodal recording.
Audio Lamps (1–4)	Show per-channel audio activity.
Filename Controls	Auto-generate timestamped filenames.
Tools / Info Menus	Conversion, preset loading, and info display.

File Outputs

Type	Extension	Description
Audio	`.wav`	Normalized audio signal.
Ultrasound	`.tvd`	Telemed cine file.
OptiTrack	`.csv` / `.mat` *(planned)*	3D marker trajectories.
Log	`_MewRecorder.log`	Session metadata.
Video	`.mp4`	Combined ultrasound + audio.

Dependencies

- MATLAB R2022b or newer.
- Windows (Admin mode recommended).
- **Telemed EchoWave II** with `AutoInt1Client.dll`.
- **FFmpeg** installed in system PATH.
- **OptiTrack NatNet SDK** *(for future full integration).*

Simplified Workflow

```
Start App → Initialize (Audio, EchoWave, OptiTrack)
        ↓
Press "Record" → Start audio, ultrasound, (and OptiTrack)
        ↓
Stop/AutoStop → Save .wav, .tvd, .csv/.mat
        ↓
Convert → Merge to MP4 (optional)
        ↓
Log saved in _MewRecorder.log
```

Notes

- The OptiTrack checkbox adds multimodal flexibility for 3D motion + ultrasound research.
- Sync can be managed by time alignment or external trigger channels.
- The GUI design remains modular for easy future integration of new sensors.