

KOIL: The Really Big Alternative to All those Tiny Tablets!

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Overview: Koil, the Really Big Alternative

We envision the Koil as a tablet device that is small enough to fit in a pocket yet expandable to 2 x 3 meters. As such, it can support applications that other lesser tablets can only dream of. We focus in this paper on three examples of this class of application; no doubt there are many others possible.

The three applications we chose are:

- A personal billboard, which can be used while driving or elsewhere to display large-font message to passersby
- A coach's application, allowing the information-intensive coachly duties to be performed by means of an advanced voice interface. We focus on football application.
- A music application, allowing unique benefits to composers and arrangers

Our Contextual Inquiry Participants

We interviewed four participants for our contextual inquiry.

Nick Leininger is a local guitarist who plays with band [name of band].

Dan Grette plays accordion and several other instruments, and does some amazingly complex musical transpositions and arrangements.

Jordan Flowers is an assistant coach at Redmond High School working with the wide receiver and defensive back skills coach. Unfortunately, the Redmond HS football season is during the fall, so we couldn't perform our contextual inquiry during a practice or game. Instead, we instructed Jordan to walk us through a typical week for a coach during the football season. Jordan also instructs the videographers (typical HS students) to ensure the game/practice film is uploaded onto the school's football laptop and then imported into hudl.com.

Tyler Slone helps out with a little league baseball team. He runs the drills for the infield players and helps with batting practice. We weren't able to observe him during a

practice or game, but he also pretended he was preparing for a game during our 30min session.

We didn't interview a participant for the personal billboard app; we didn't see how to do that especially for the use of this while driving. But we think the use will be obvious once we demonstrate it to the class.

Contextual Inquiry Results

1. Musicians

The two musicians we interviewed will find Koil (a) worth very little and (b) thrillingly appropriate!

Nick Leininger, Guitarist



Nick (on the right above) plays guitar, and as such is interested only in chords and not in the whole musical scales as are other musicians. He rarely even arranges chord sequences; in fact the only written artifact his band, Tapsalteerie, uses in performances is a simple list of songs, with occasional extra instructions "Nick comes in after Pat; the second section is run through twice" and so forth.

The Koil could certainly handle this simple list of instructions and could of course present the chord sequences for Nick in practice or in performance.

In general, though, the existing (paper) technology in use by Nick and his band seem sufficient for them, and the Koil would probably be of limited use.

Dan Grette, Accordionist

Dan's current project is taking a piano arrangement of a Anitra's Dance (see the Appendix) and making changes to allow it to be played on his accordion.

The challenges of this project:

- Some of the chords represented as piano notes do not exist as buttons on his accordion, requiring him to approximate the sound by using another chord.
- There are some dissonant passages that are designed for the piano's attack/sustain/decay sound structure. The accordion plays the same note at the same intensity and pitch as long as you hold down its key, so changes have to be made to the notes to reduce the dissonance, which sounds too intense on the accordion as written.
- The fingering has to be adapted for the accordion, as the 'key real estate' to be covered is multidimensional and the fingers have to be kept in motion flowing back and forth to be in the right position for the next passage.

Dan's physical challenge:

He's 57 years old and needs trifocals, but instead switches back and forth between different pairs of reading glasses to be able to see what he's doing in different circumstances.

The Koil will be perfect for Dan! It can:

- Assist his transposition project by suggesting chord substitutions, playing short sequences, etc.
- Display the music in as large a font as he requires without any reading glasses whatsoever!

The Koil Music Interface

The Koil Music UI won't look like much to a non-musician, as its musical knowledge is embedded. Basically there are just two choices:

Koil Music

Arrange

Capture

And after that it just looks like a musical staff and responds to voice commands, sung notes, and generally does what a musician would expect.

(See KoilMusicCaptureP.pdf delivered with this paper. Sorry, we had trouble inserting the graphic inline here.)

2. Football and Baseball Coaches

During our inquiry sessions with Jordan and Tyler, the most obvious similarity for coaches are the amount of printed materials each carries to a practice or game. Both Jordan and Tyler brought printed schedules, agendas, rosters, lineups, and statistic/score sheets. Jordan also brought some printouts of play cards. They seemed perfectly ok with the amount of prep work and manual collaboration required before assembling these paper materials.

Schedule: In Tyler's case, this was the planned season schedule, practice/game dates, location and times, along with the opponent for the game. For Jordan, he brought a monthly calendar with only opponents and whether the game was away or home.

Practice Schedule: Jordan had a very detailed practice plan, every 10-15min was precisely laid out for each drill and which player group partakes in which drill (as the offensive lineman would be in a blocking drill while the wide receivers would be in an agility drill, etc).

Rosters: Each brought a simple table which listed the player's name, and the position. Jordan's roster also included the school year, height, weight, and position of the player.

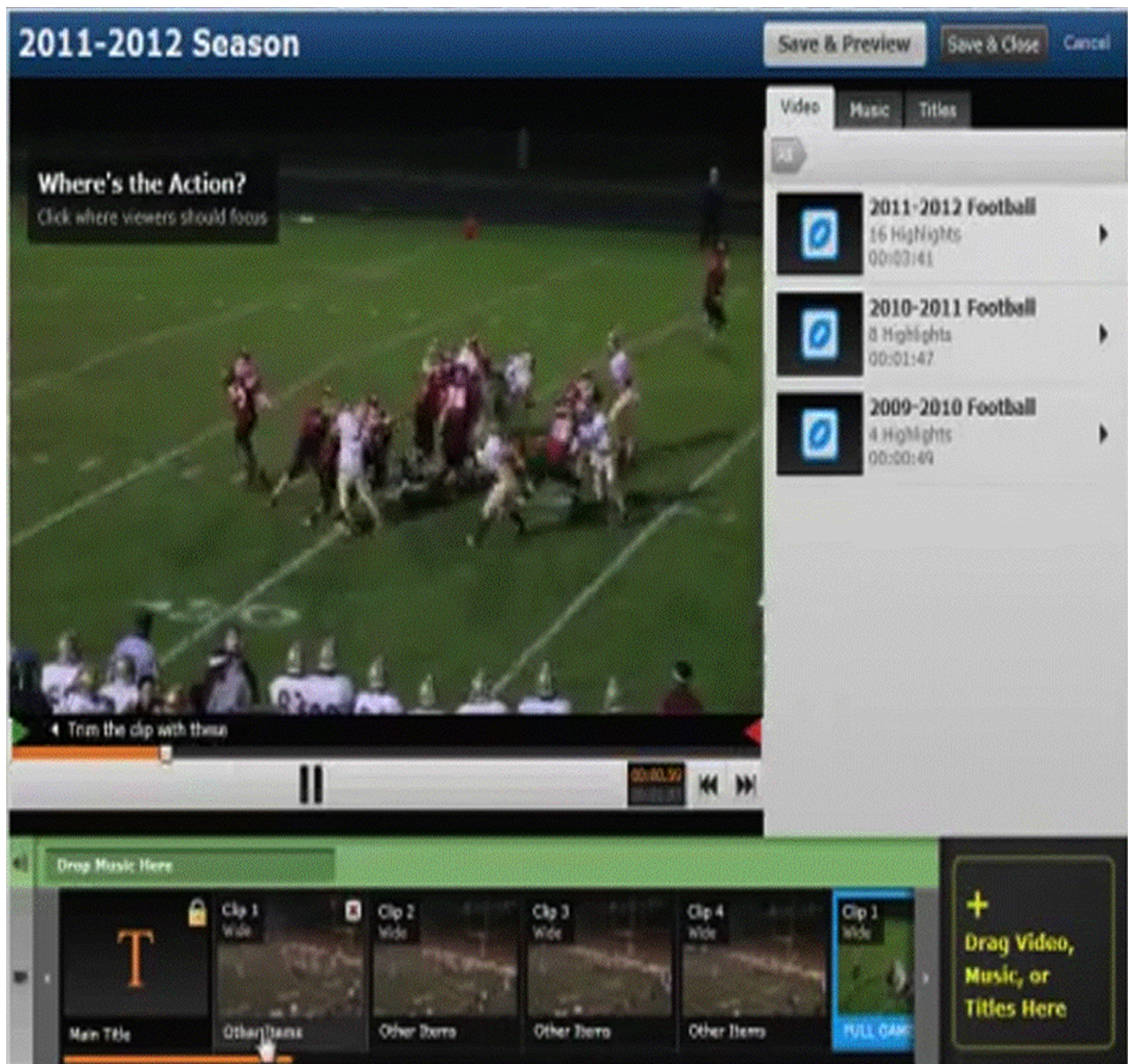
Lineups: Jordan brought a starting lineup for the last game of the season. Simply had each position and which player was starting.

Play Cards: Sports with designed plays, such as football, need to be diagrammed so each player understands their purpose in the play. These are commonly sketched out on paper using X's and O's detailing an offensive or defensive play.

Jordan mentioned that each assistant coach was required to have his agenda submitted to the head coach by 10am every practice day so that the head coach could assemble the practice schedule and make copies for each coach. Jordan mentioned that this task of assembling the practice schedule probably took the head coach 45min to perform, so each assistant coach's agenda was honored. The head coach was also able to change the practice schedule and focus on drills/plays he felt the team needed to improve. As the season went on, creating the practice schedule was easier, as it became more routine for the players, coaches and everyone involved.

Tyler mentioned that the head coach created the practice schedule entirely, that the assistant coaches didn't have much prior input, but he also mentioned that baseball is quite a bit simpler in the sense that there aren't many designed plays.

Jordan then began to describe the amount of practice filming the team captures. Once they get into scrimmages (after warm-up and player group drills), the videographers (injured players or volunteer students) will record each play, starting the recording just as the huddle breaks, and will stop the recording after the play is called dead. They repeat this for every play. Jordan then takes the digital video files and uploads them into the school's designated football laptop. He will then upload each file into the school's account on hudl.com. The school pays for this service, and they primarily use it for film review and scouting purposes, below is a screenshot of hudl's interface.



Similarly, immediately following a game on Friday night, Jordan will upload the game film, they will usually have 2 different angles of the game, one perspective from the 50 yard-line, and one from the end-zone stands. Jordan mentioned that syncing the 2 different files takes time to make sure the plays are in order, and since each camera operator doesn't start/stop the play at exactly the same time. He wishes this upload and syncing process could be more streamlined. The following day (Saturday), each assistant coach is required to go through the game film on hudl.com and mark the play ran, the outcome and annotate notes. Sunday night from 7pm-10pm, all the coaches meet and review the game film. They also use this time to set the agenda for the following week of practice.

Tyler described the decisions the head coach must make prior to setting a starting lineup. The coach first needs to look at the schedule and make sure the pitcher is able to pitch (little league has rules limiting a pitcher to XX pitches per X days), the scouting information for the opponent,

the available roster, and player performance. Tyler mentioned that this is easy for little league, but this process gets more complicated as the league's get more competitive. He mentioned that having an algorithm to recommend a starting lineup would be incredibly helpful.

We learned lots performing these inquiries, both coaches had needs to streamline the process to prep for a week of practices, game days and to review the game film. Both wanted this effort to be more collaborative. Both Jordan and Tyler mentioned that a tablet device would be beneficial to a coach during practices and games instead of fumbling with the paper materials.

2 Answers to Task Analysis Questions

We answered these questions three times, once for each application.

Football Coach

1. Who is going to use the system?

Football Coaches

2. What tasks do they now perform?

Player Development

Scouting

Play Design

Video Manipulation

Scheduling

Rosters

3. What tasks are desired?

Playbook

Collaboration with other assistant/head coach

Practice Plans

4. How are the tasks learned?

Apprenticeship

5. Where are the tasks performed?

Football field and coaches offices

6. What's the relationship between customer & data?

7. What other tools does the customer have?

Chalkboards

Video

Paper and pen

8. How do customers communicate with each other?

Emails

Phone

Text Message

Personal conversation

9. How often are the tasks performed?

Daily during season

Weekly during offseason

10. What are the time constraints on the tasks?

Assigned time for practice and games

11. What happens when things go wrong?

Lose Games

Player Injuries (especially concussions)/Death

Confusion between coaches

Team morale down

Musicians

1. Who is going to use the system?

Musicians

2. What tasks do they now perform?

Practice

Performances

Arranging music

Composing music

Recording music

3. What tasks are desired?

Sing and see notes appear on staff

Collaborate with band members

Better interface for arranging, composing, recording music

4. How are the tasks learned?

Practice

Lessons

5. Where are the tasks performed?

Home

Office (arranging, composing)

Performance Halls

School

Street

Garage

6. What's the relationship between customer & data?

7. What other tools does the customer have?

Paper

Recording Devices

8. How do customers communicate with each other?

Email

Text

Phone

Group practice sessions and other meetings/conversation

9. How often are the tasks performed?

Varies; daily for many musicians

10. What are the time constraints on the tasks?

Varies

11. What happens when things go wrong?

Off-key, people boo and throw tomatoes

Frustration

Confusion between band members

Personal Billboard

1. Who is going to use the system?

Drivers with something to express

Fans at sporting events wanting to express their feelings

2. What tasks do they now perform?

Cursing to self

Pounding steering wheel

Road rage

Hand gestures

Yelling at referees and players

3. What tasks are desired?

More nuanced method of expression (but still in

42pt type)

4. How are the tasks learned?

Mostly innate primate instinct

5. Where are the tasks performed?

Cars

Sporting Events

6. What's the relationship between customer & data?

7. What other tools does the customer have?

Hand Gestures

Weapons

Cardboard signs (at sporting events)

8. How do customers communicate with each other?

Hand Gestures

Weapons

Yelling

Cheering at sporting events

9. How often are the tasks performed?

Continually

10. What are the time constraints on the tasks?

Split-second, as changes in traffic or on field happen

11. What happens when things go wrong?

Death

Car wrecks

Fights among drivers

Football hooliganism

3 Tasks for Koil:

We chose the following 3 tasks for Koil in the increasing order of difficulty.

Display your personal expression through your car backseat (Easy):

Koil can be used as a means for personal expression. It can have a wide variety of applications in this realm. Imagine holding Koil up to support your favorite team at a game or using it in your car back seat to send a message to the driver behind your car.

The task is to use Koil to tell a tail-gater behind your car in traffic to back off.

We chose this task because it is simple to do and it would be good to validate our how easy it is to use Koil to achieve a simple task of displaying a message. We plan to use mainly voice interface for this task as Koil is not going to be physically accessible to the driver when installed in the back window of the car.

Arrange music through Koil (Moderate):

Koil's Music app can be used to play a piece of music and arrange it as you wish. Koil displays the notes of a previously saved song (it also has ability to search new songs from the web). The musician can then change the notes of the song and ask Koil to play

the notes in an instrument of his choice. For example, a song written for a piano can be modified to be played on an accordion using Koil without having to go through the pain of playing each note manually on an accordion and saving it on a music sheet.

The task is to modify 'Antaris Dance' using Koil's Music app to be played on an Accordion. Koil has settings available to change the instrument that will be used to play a song. If certain notes are not available for the instrument of choice Koil we use its best approximation to replace it with another note. If there are part of the song that need improvement, modify those parts using Koil until you are happy with the results.

Correct a Football Player by Viewing His Play Video (Hard):

Koil's football app can be used by football coaches to view previous games and base their future strategy on that. They can also improve their team's performance by annotating videos with information on where the players made mistakes and sharing those videos with them via email. This also protects the morale the players by not being reprimanded in front of the rest of the team for their mistakes while getting constructive actionable criticism.

In this task we use both the voice and touch commands of Koil.

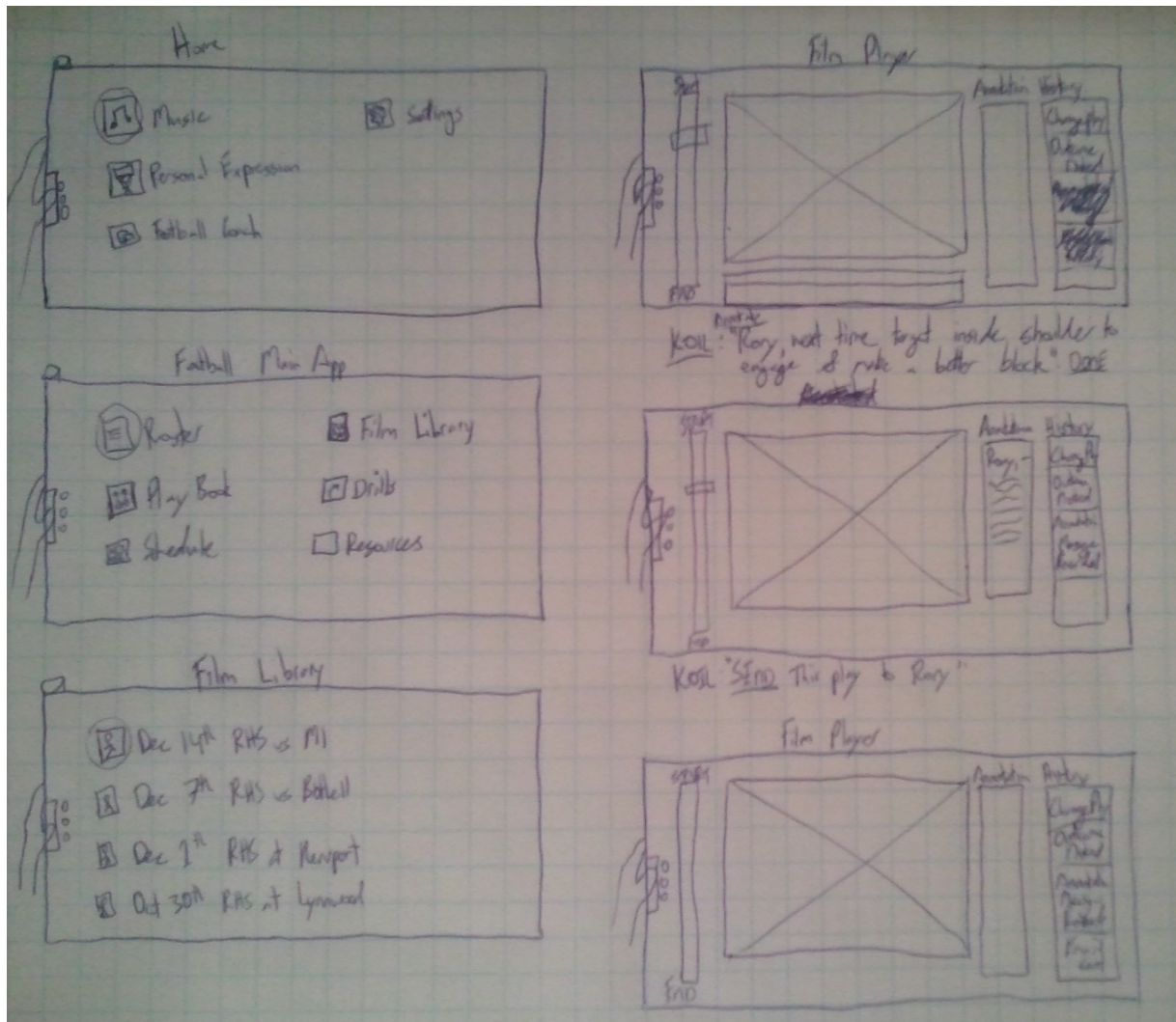
The task is to use Koil's Football app to view the game from April 25, 2012. Go to Play 8 of the game to review Ben's performance. At 12 min and 43 sec Ben gets tackled. Select that portion of the video and annotate it with suggestions to Ben for improvements in the next game. Share your annotation with Ben.

4. Initial Design Sketches

Here are three rough sketches of the football app. The first doesn't include any touch elements, it is purely voice operated:



Here's a version of the football application where the user is able to use his/her thumb to scroll through the on-screen lists. We found it to be too disjointed between the action of the thumb and the result on the interface. This is synonymous with using Windows without a mouse, everything needs to be done through ALT plus the arrows.

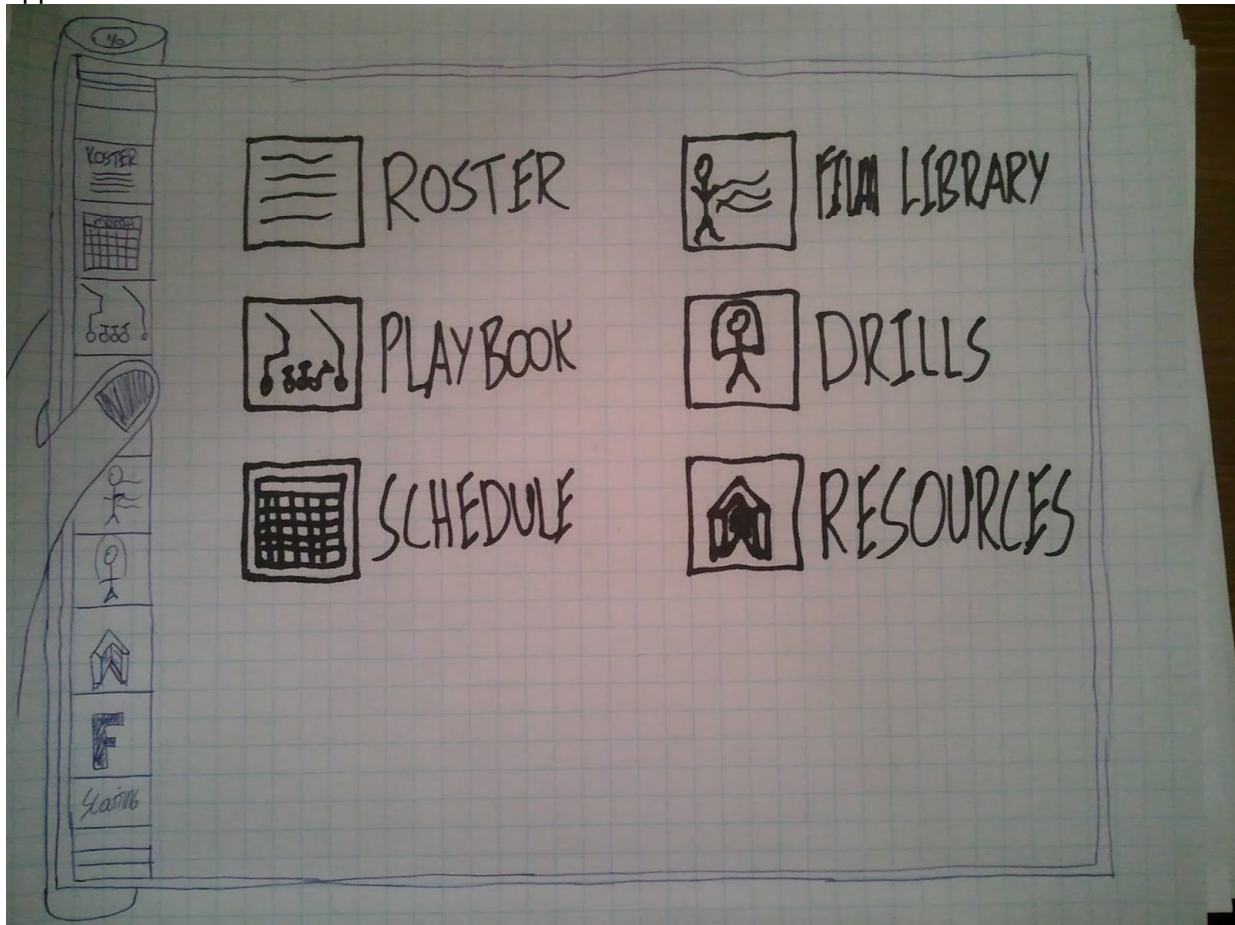


Here's a version where the user can bring into view a scrollable list which can be manipulated with a flick of the thumb. Tapping on the icon will perform that command.

WELCOME
TO
KOIL



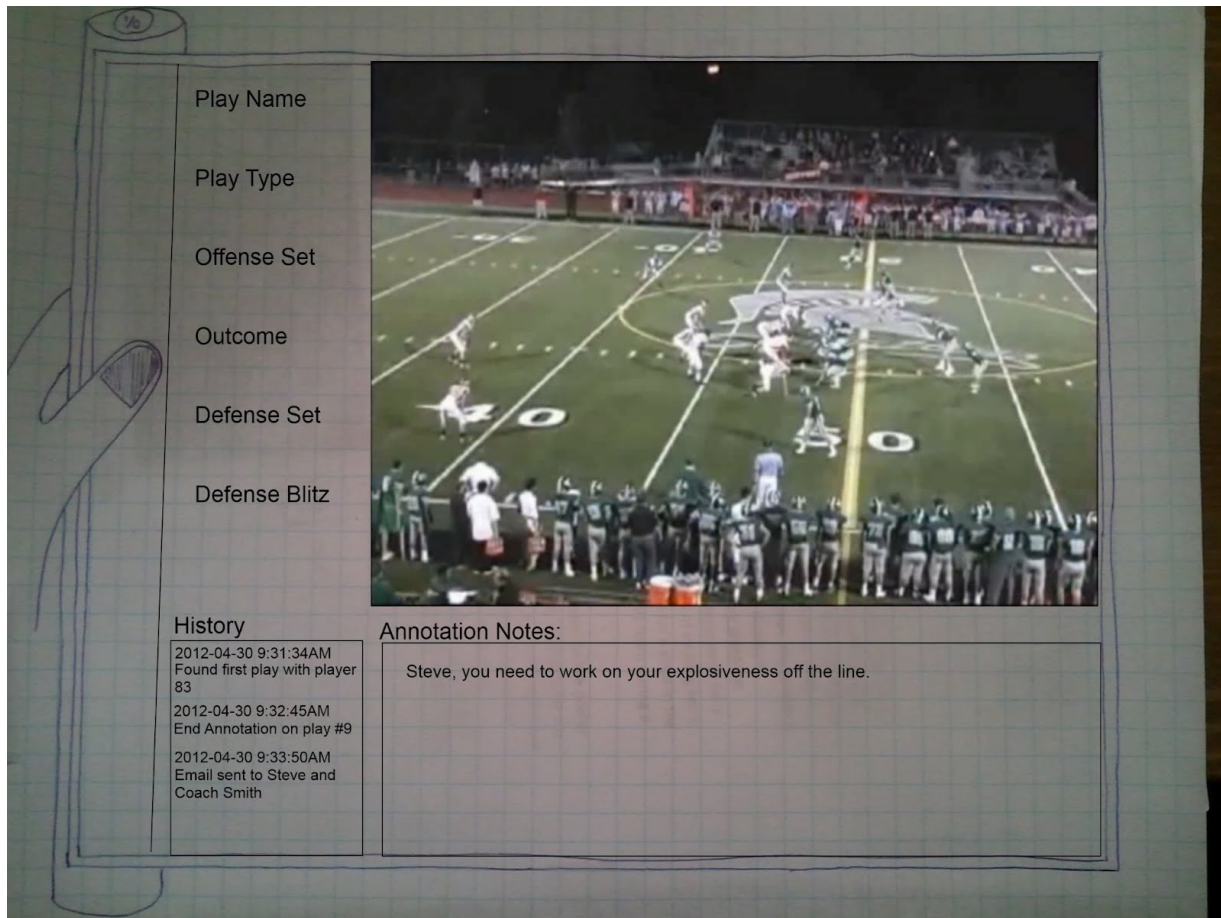
The KOIL's home, the user is able to say a command or use the scrollable list to launch an application



The Coach's Football Friend app. The user is able to tap on the icon, or use the bar to select the desired action.



The film library, a list of films available to the user. The user can tap on the icon or link to start reviewing the film.



The user navigated through the film, annotated a play, and sent an email to the player and coach informing them of the area for improvement.

5. Selected Interface Design

When comparing the 3 designs we realize that we are not exactly comparing apples to apples here as the 3 tasks we chose are quite diverse but we feel that it is important to try out a varied set of tasks in order to validate the usability of Koil.

We chose the **Football** app as our selected interface. The main reason we chose this idea is that we feel it exploits Koil's potential best.

Big working surface: Coaching a football team is a complicated task. When strategizing, making rosters and defining Play Cards, the coaches need a big working surface to tag the football field with players, notes, strategies etc.

Mobility: Coaching a football team is a very mobile task. The coaches need to move around the field, locker rooms, training rooms, hallways etc. and in order to have an effective conversation with their colleagues or players, they need a device that can fit in their pocket and carry all their ideas around with them.

Connectivity: Since Koil is basically a new form-factor for a computer, it is easy to integrate social and web connectivity in the device. The coaches can interactively strategize with other coaches without being in the same room. They can also send corrective instructions to the player using this device. The players can log in (via a traditional browser) to the web portal and view their reviews at their own convenience and can also chat interactively with the coaches if they need further clarifications or guidance.

Presentability: Koil can be used by the coaches to present their strategies to the players in a team meeting by expanding Koil to its fullest size. They can also take notes from the meeting right on the device and send screenshots as emails to the players and other coaches.

Design of the Football App

The app has the following main features:

- Film Library
- Roster
- Play Book
- Schedule
- Drills
- Resources

User Interface Description

We chose the interface which is a blend of the three. The KOIL will respond to voice commands and interpret natural language. The entire screen will be touch screen so the user can select icons and manipulate the objects in a multi-touch fashion. Additionally, the vertical scrollable bar near the cylinder will allow the user to quickly scan through items pertinent to the OS, or the Application in focus. This UI element will remain hidden, unless the user swipes in from the edge of the screen to activate it. After a timeout of inactivity, the bar will disappear.

6. Scenarios

Personal Expression:

Koil has a touch and voice interface. For this task we mainly utilize the voice interface as that is most natural. It comprises of the following steps:

1. Set Koil to its desired height and width
2. Display it in the back seat window of your car (securing it with some off-the-shelf accessories) and drive off.
3. Use Koil to tell a tail-gater to back-off

Commands available are as follows:

- “Koil” – this enables Koil’s listening mode. Whatever you say beyond this point will start getting retained in Koil to be displayed.
- “Dot” – Display the message.

Koil Music App:

For this task we use a combination of Koil’s voice and touch interface. The task comprises of the following steps:

1. Open Koil and set it’s desired dimensions.
2. Launch the Music app
3. Open ‘Antaris Dance’ on Koil
4. Select a sequence
5. Play the sequence in Piano mode
6. Play the sequence in Accordion mode
7. Adjust notes in a selected sequence
8. Repeat steps 4 and 5 until you are satisfied with the adjusted notes
9. Save the new notes
10. Continue

Commands available are:

- “Play” to play the selected sequence. If no sequence is selected, the song is played from the beginning
- “Mode” “<instrument>” to change the instrument the selected sequence will be played with
- “Suggest” to seek help from Koil in selecting a note that does not sound right or that is not available in the instrument of your choice.
- You can select a note or a sequence using touch interface on Koil and tapping or circling over the note(s).
- “Note” “<New Note>” to change a selected note to something else.

Koil Football App:

1. Open Koil and adjust its desired dimension
2. Launch the football app
3. Select the game video from Dec 7th, 2011
4. Watch the 8th play of the game
5. While watching the play, annotate with a message for the player for e.g. “Ben, you should have thrown the ball to Jessy at this point. Next time be more vigilant of the team mates near by.”
6. Send the annotation and video clip of 8th play as an email to Ben

Commands available are:

- “Play game on <date>”
- “Show play <play number>”
- “Pause” to pause the video
- You can use touch on the video progress bar to go forward/backward.

- You can select a part of the video by sliding your finger over the progress bar
- “Annotate <message>” to begin annotating a selected frame. If no frame is selected, the annotation is added to the video
- “Dot” to end the annotation
- “Email to <name>” to email the selected frame with annotation to another user.