CAS Ratemaking Seminar

March 19, 2018

Katie DeGraaf

Director of Product, Insurance Solutions

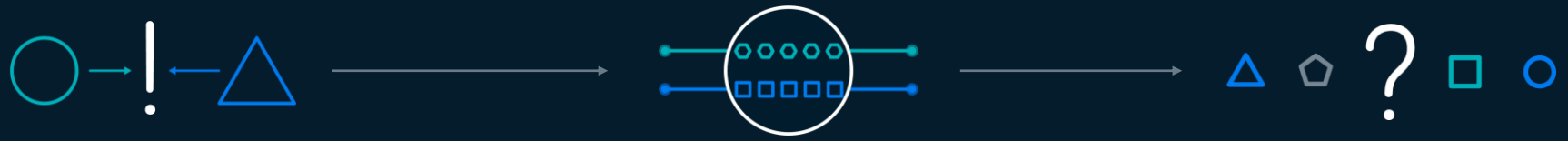
Polling Question #1

Do you consider yourself an above average driver?

A. Yes

B. No

The evolution of individualized pricing



Past

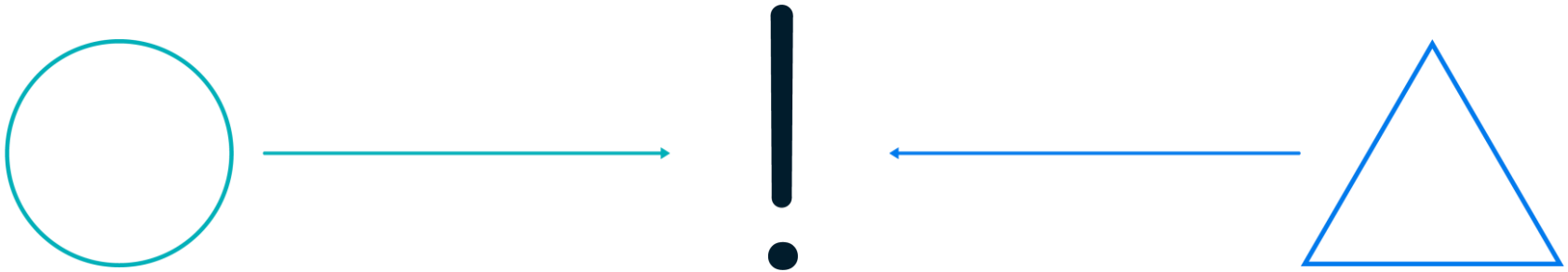
- Who's driving?
- What are they driving?

Emerging

- Evaluating driving behavior from all angles
- Impacts on individual premiums

Future

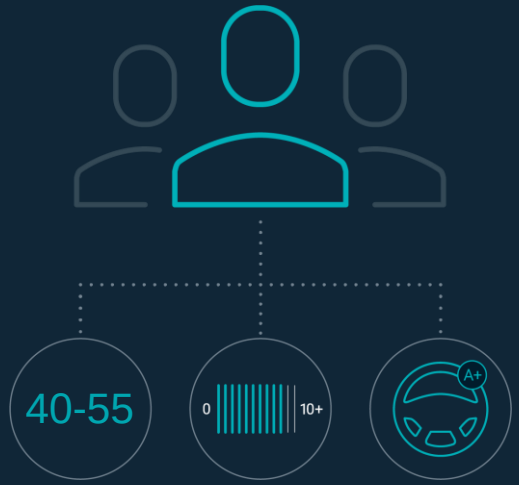
Traditionally, we've modeled risk based on who and what.

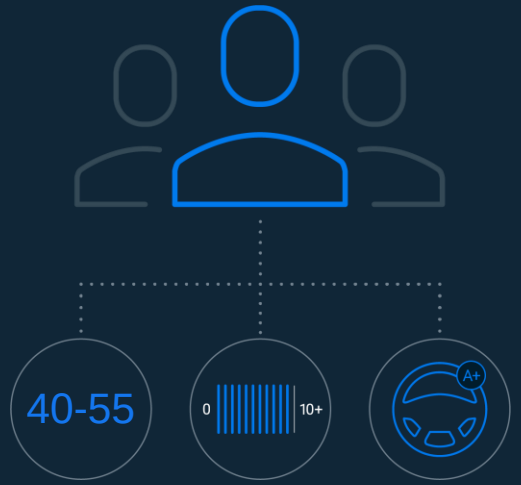


Meet Katie and Heidi.

Who they are

	Katie	Heidi
Age	Adult	Adult
Gender	Female	Female
Household status	Married, kids are good students	Married, kids are good students
Years licensed range	2—10+	1—10+
Age of oldest driver	40—55	40—55
Excluded driver	None	None



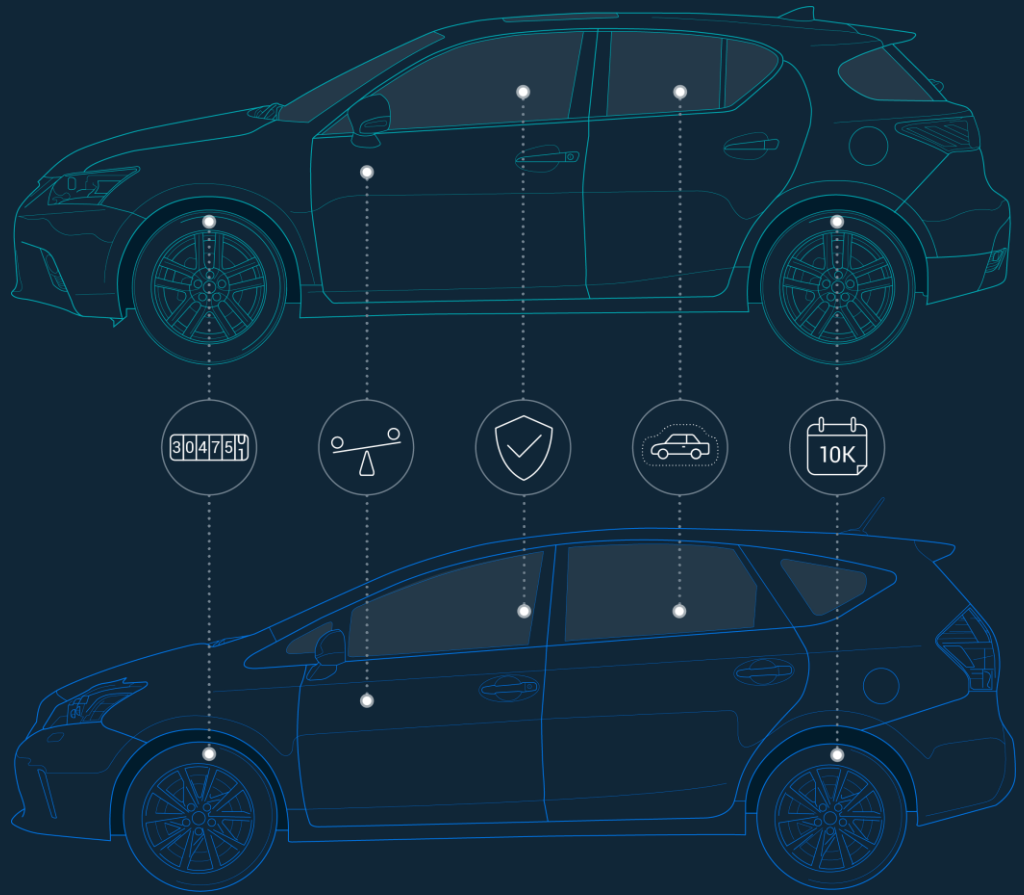


Who they are

	Katie	Heidi
Homeowners	Yes	Yes
Location	Garage at residence	Garage at residence
Zip code /address	604XX	604XX
Financial responsibility	Yes, Pay in Full, EFT	Yes, Pay in Full, EFT
Persistency	5 years	7 years
Number of eligible vehicles	3	3
Other pols	Home, small toys	Home, small toys

What they drive

	Katie	Heidi
Vehicle type & mileage	2014 CT 200H; 30k	2015 Prius V; 20k
Vehicle ACV	$17,000	$18,000
Vehicle stability control	Yes	Yes
Basic safety systems	Airbags, anti-lock brakes, no motorized seat belts	Airbags, anti-lock brakes, no motorized seat belts
Coverage amounts	100/300, $1000 Ded, Rental/towing	100/300, $1000 Ded, Rental/towing
Annual mileage	10,000	10,000
Vehicle use	Pleasure	Pleasure



	Katie	Heidi
Zip code/address	604XX	604XX
Homeowners	Yes	Yes
Age	Adult	Adult
Gender	Female	Female
Household driving record	No convictions; No accidents	No convictions; 1 fender bender not submitted
Household status	Married, kids are good students	Married, kids are good students
Location	Garage at residence	Garage at residence
Number of eligible vehicles	3	3
Years licensed range	1—10+	2—10+
Age of oldest driver	40—55	40—55
Excluded driver	None	None
Financial responsibility	Yes, Pay in Full, EFT	Yes, Pay in Full, EFT
Persistency	7 years	5 years
Other pols	Home, small toys	Home, small toys
Vehicle type & mileage	2014 CT 200H; 30k	2015 Prius V; 20k
Vehicle ACV	$17,000	$18,000
Vehicle stability control	Yes	Yes
Basic safety systems	Airbags, anti-lock brakes, no motorized seat belts	Airbags, anti-lock brakes, no motorized seat belts
Coverage amounts	100/300, $1000 Ded, Rental/towing	100/300, $1000 Ded, Rental/towing
Annual mileage	10,000	10,000
Vehicle use	Pleasure	Pleasure

Two drivers look alike on paper, so we price them similarly.

Katie's 2016
Semi-annual Premium

$452

Age: Adult

Gender: Female

Zip code: 604XX

Heidi's 2016
Semi-annual Premium

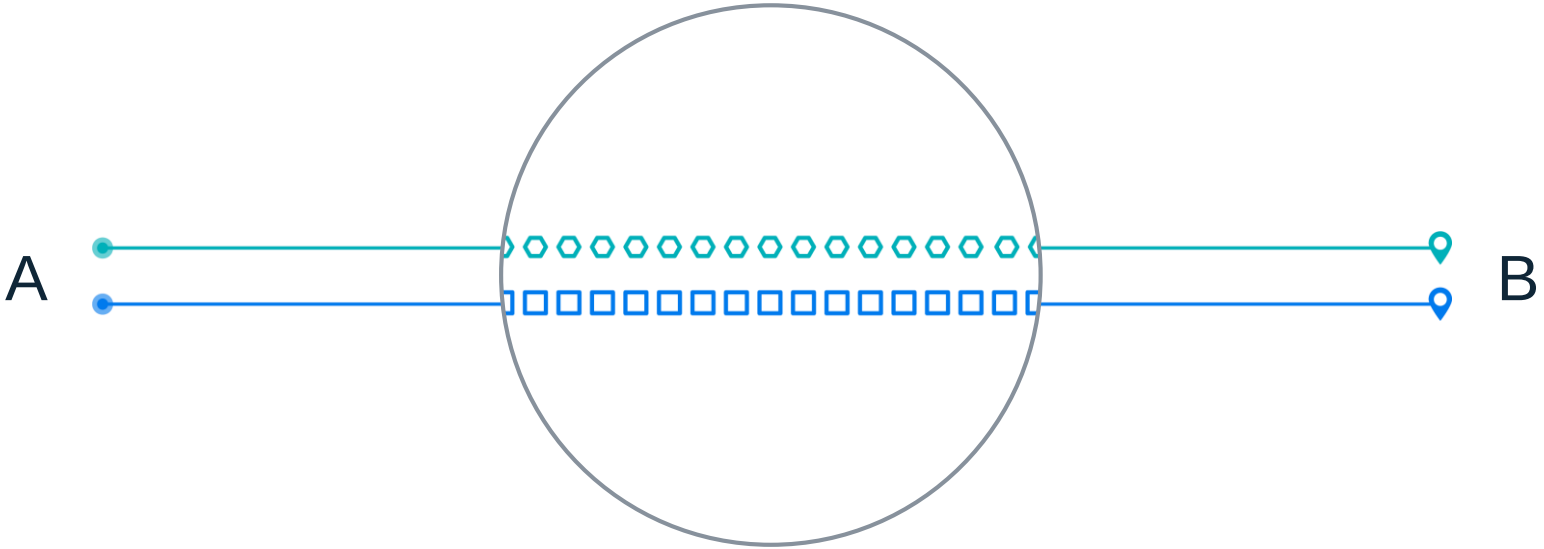
$465

Age: Adult

Gender: Female

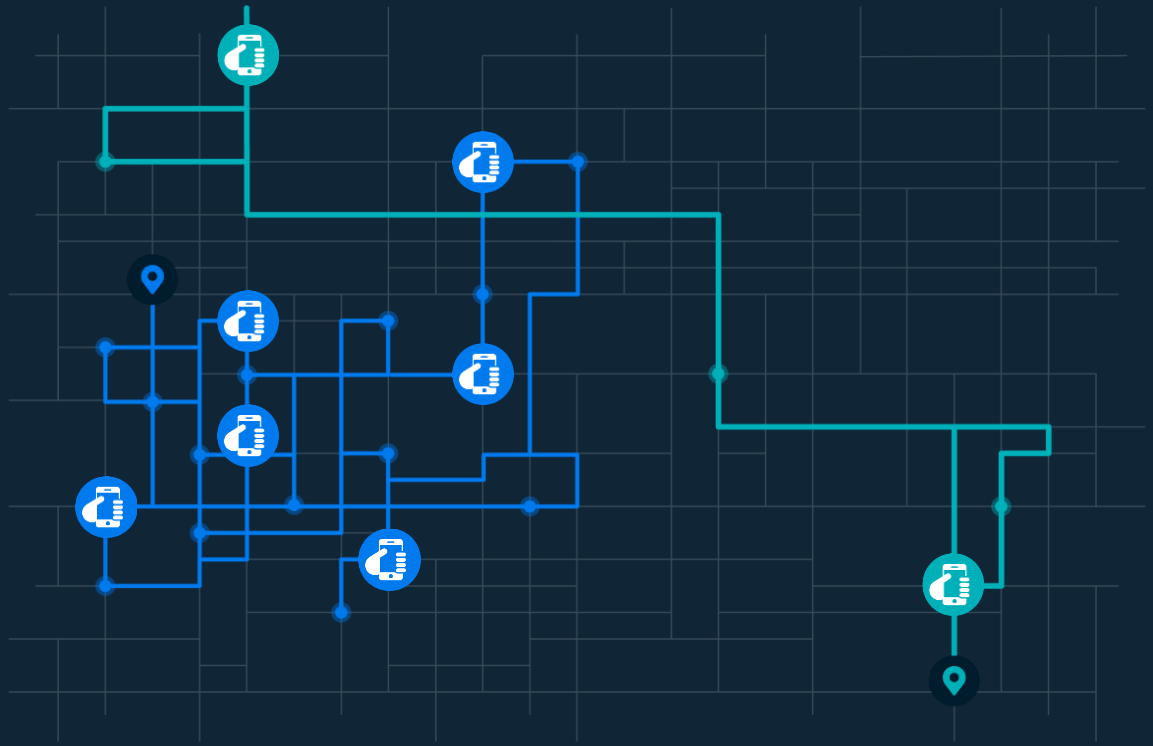
Zip code: 604XX

But we aren’t looking hard enough. How do drivers actually drive?



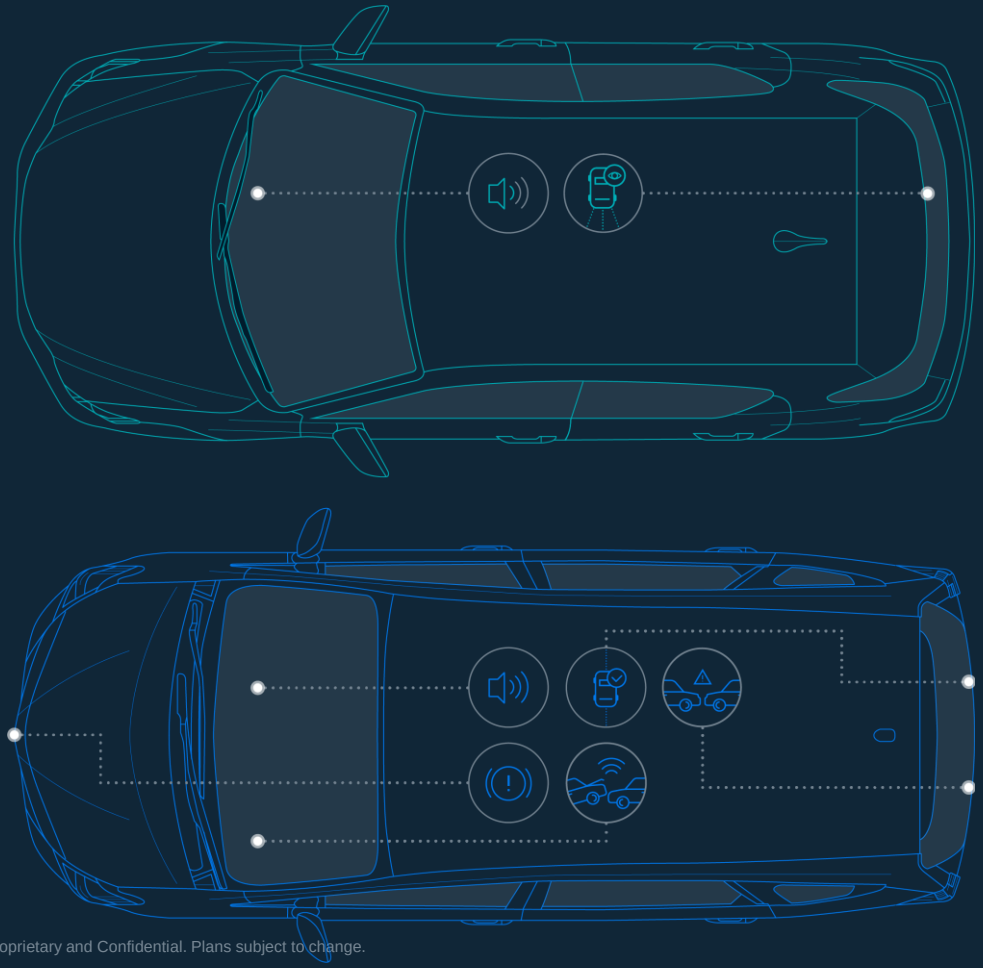
Telematics data gives us unprecedented insight into individual driving behavior…

	Katie	Heidi
Type of driving	Minimal, Highways	Daily, Suburban roads
Average number of trips/week	6	24
Average length of trip	32	8
Time of day	Off peak	Rush hours, school hours
Road type	Uncongested freeway	Local, busy, congested streets, parking lots
Driving condition	Cruise control + podcast	Noisy, distracting
Distracted driving	2 per trip	6 per trip



…and vehicle features in use.

	Katie	Heidi
ADAS	Rear view camera	Pre-Collision Safety System Adaptive Cruise Control Post Collision Safety System Stolen Vehicle
Inactive systems	None	Safety System Lane Departure Warning Adaptive Cruise Control
Radio volume	Soft	Loud



Things aren't always as they appear.

Katie's 2016
Semi-annual Premium

$371

~~$452~~

Age: Adult | Gender: Female

Zip Code: 604XX | Driving Score: 93

Distracted Driving: 92 | Time of Day: 98

High Speed: 86 | Hard Braking: 97

Heidi's 2016
Semi-annual Premium

$465

Age: Adult | Gender: Female

Zip Code: 604XX | Driving Score: 64

Distracted Driving: 63 | Time of Day: 62

High Speed: 72 | Hard Braking: 60

Polling Question #2

How often do you pick up your phone while driving?

A. Never

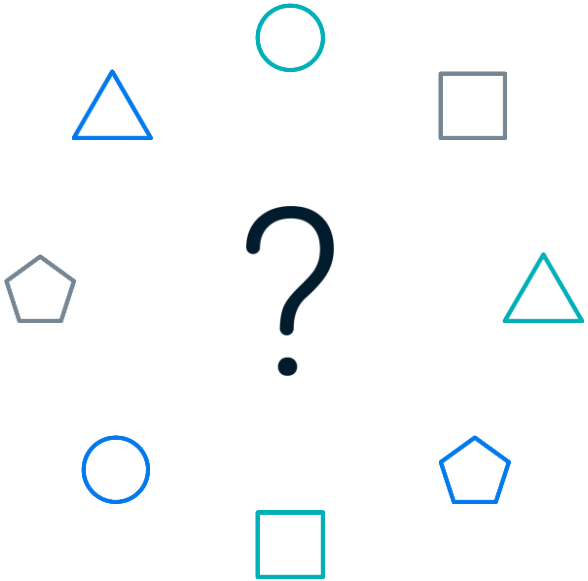
B. Only at stop lights

C. Infrequently (take a call or make a change to nav, music, etc)

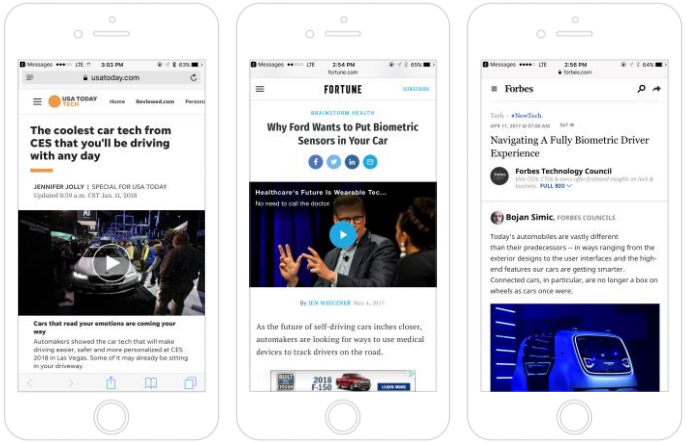
D. More often than that

E. Constantly (I watch Netflix)

Who knows what factors we might be considering tomorrow?



OEM's are beginning to deploy biometrics.



US 20180047201A1

(19) **United States**

(12) **Patent Application Publication**
Filev et al.

(10) **Pub. No.: US 2018/0047201 A1**
(43) **Pub. Date: Feb. 15, 2018**

(54) **EMOTIVE ADVISORY SYSTEM AND METHOD**

(71) Applicant: **Ford Global Technologies, LLC**, Dearborn, MI (US)

(72) Inventors: **Dimitar Petrov Filev**, Novi, MI (US); **Oleg Yurievitch Gusikhin**, West Bloomfield, MI (US); **Erica Klampfl**, Canton, MI (US); **Yifan Chen**, Ann Arbor, MI (US); **Fazal Urrahman**

	G06N 3/00	(2006.01)
	G10L 17/26	(2013.01)
	G01C 21/36	(2006.01)
	A61B 5/16	(2006.01)
	B60W 50/10	(2012.01)
	G06F 3/01	(2006.01)
	A61B 5/18	(2006.01)
	G06T 13/20	(2011.01)
	B60W 40/08	(2012.01)

(52) **U.S. Cl.**
CPC ***G06T 13/40*** (2013.01); ***A61B 5/18***

12. Algorithms may direct the EAS **10** to do this if, for example, certain vehicle operating parameters, such as tire pressure, fuel levels, engine temperature, etc., reach critical levels. Such an algorithm may provide that if the engine temperature is "hot", ignore all but vehicle systems outputs. In still other embodiments, the EAS **10** may automatically ignore all but the image recognition outputs and occupant emotion if, for example, the EAS encounters a new driver and is attempting to establish an emotional bond with this new driver. Other arrangements are also possible.

[0122] The emotion generator **132** may apply one or more algorithms, implemented in the embodiment of FIG. **9**A, as a set of rules, similar to those discussed with reference to the emotion estimator **140** illustrated in FIG. **9**B, to aggregate the inputs and generate the simulated emotional state for the avatar, i.e., avatar emotion. This emotional state takes the form of a weighted multi-variable vector, i.e., emotional vector. As discussed above, this emotional vector may include variables indicative of the emotions "happy," "sad," "surprise" and "fear" ("excitement-quiescence," "pleasant-unpleasant," etc.) Each variable may include an associated weighting value to indicate the degree with which that particular emotion is to be expressed. As discussed above, however, other techniques may be used to produce the emotional state for the avatar. For example, a suitable neural network may be provided that aggregates the various inputs received by the emotional generator **132** into the simulated emotional state of the avatar.

[0123] As discussed above, the EAS **10** illustrated in FIG. **1** may engage in conversation with the occupant **12** also illustrated in FIG. **1** to gather information from the occupant **12** and/or provide information to the occupant **12**. Algorithms/techniques/methods used to manage and facilitate this conversation are discussed with reference to FIGS. **10** though **12**.

[0124] Referring now to FIG. **10**, a spoken dialog manager **142** receives inputs originating with the occupant **12** illus-

given context. For example, a rule may provide that a downward gaze of at least 20 seconds will result in a task being generated that will remind the driver to keep their eyes on the road. The text and priority associated with such a task may be "Keep your eyes on the road!" and "High" respectively. The high priority of the task will cause the avatar to interrupt between words, for example, and abort any current task to convey the urgency needed to ensure the occupant is alerted. In this example, the task does not include an action for an agent as no agents are involved in the execution of this task. The task also does not include a triggering event because the task is intended to be performed immediately. Another rule may provide that a request from the occupant to "Put the vehicle in fuel economy mode." will result in a task being generated that will alter the appropriate engine tuning parameters to make the engine more fuel efficient. Assuming that such altering of engine tuning parameters must take place while the engine (not shown) is idling, the text and priority associated with such a task may be "I am putting the engine in fuel economy mode." and "Medium" respectively. The action may be directed to a powertrain agent and will include the appropriate instructions that will permit the agent to alter the desired parameters. The triggering event may be the engine at idle for at least 3 seconds. Still yet another rule may provide that any agent initiated task, discussed in more detail below, will result in a task being generated that will ask the occupant **12** illustrated in FIG. **1** whether it is acceptable to perform the task if the occupant emotion is "unhappy." The text and priority associated with such a task may be "I don't want to bother you, but the X agent recommends that I do Y. Is that O.K.?" and "Low" respectively. Other and/or different rules may also be implemented.

[0128] Referring now to FIG. **11**, the algorithms/rules discussed above may be implemented in a task generator **144** as software or firmware. Other suitable alternatives, however, are also contemplated.

Biometrics can revolutionize how we understand drivers.

	Katie	Heidi
Brainwaves	Less attentive	Very alert
Eye movement & gaze	Nav to street	All around the vehicle
Blinking	Excessive	Normal
Heart rate	High	Normal
Voice modulation	Quiet	Noisy
Blood alcohol content	—	—
Medical devices	—	—
Sensor data (Rideshare)	—	—

As mobility behaviors change, so does individualized risk.

Predicting future losses requires an understanding of how drivers act—both at time of quote and renewal.

Katie's **2018**
Semi-annual Premium

▼ $316

~~$452~~

Age: Adult

Gender: Female

Zip code: 604XX

Driving Score: 98

Heidi's **2018**
Semi-annual Premium

▲ $535

~~$465~~

Age: Adult

Gender: Female

Zip code: 604XX

Driving Score: 64

Polling Question #3

How frequently do you use a ride or car share service?

A. Never

B. Rarely

C. Often

D. Daily

The world of mobility is evolving. How should we?

Small group discussion

As actuaries get closer and closer to being able to rate a risk as an individual, is the concept of risk pooling lost? Does it matter?

> How do we reconcile this with the large variance of rates for an individual from a comparative rating tool? If customers begin to see the variance in their rate for their individual risk, does this change the way insurance is priced in the USA?

Where do we see regulation and/or interveners affecting rate classification the most? How can we as actuaries prepare and educate/collaborate accordingly in this realm?

If research indicated that a particular analytical method more accurately predicted risk (but was difficult to interpret), should actuaries use it to develop rating plans? Why or why not? Comparative rater question