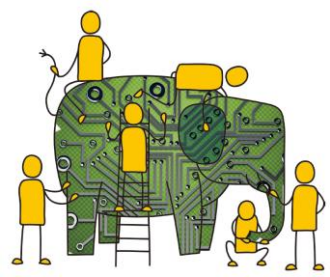


디지털 데믹: 숨겨진 위험들

차성덕

고려대학교 컴퓨터학과

“안전한 시민, 안전한 소프트웨어 ”



소프트웨어가 만드는 “ 새로운 세계 ”



자율주행 자동차

- On a narrow street, her Tesla automatically tucked in its side mirrors so that it wouldn't scrape other cars.
- they're capable of giving bicyclists a wide berth while passing.
- ...

Tesla Is Now Beta-Testing 'Full Self Driving' in Real-World Traffic

Is Tesla FSD truly a Level 5 system if you still have to monitor it, aside from legal liability?

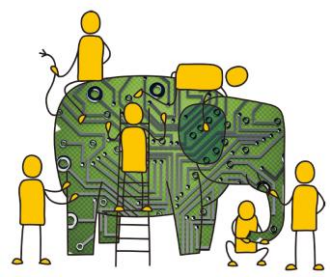


BY JAY RAMEY • OCT 21, 2020



- ♦ Tesla rolls out Full Self Driving in limited number of vehicles
- ♦ FSD has been promised to offer Level 5 autonomy
- ♦ Legal liability remains untested in serious crashes of semi-autonomous vehicles

2020년 10월 21일 뉴스



디지털 데믹? 숨겨진 위험?

- **Teslas appear to**
 - blow through red lights
 - stop well short of intersections
 - miss turns
 - nearly rear-end a parked car
 - make a turn from the wrong lane
 - speed over speed bumps
- 다른 자율주행 자동차 소프트웨어는 유사한 오류가 없을까?



'I'm not drunk, it's my car:' Tesla's 'full self-driving' gets mixed reviews

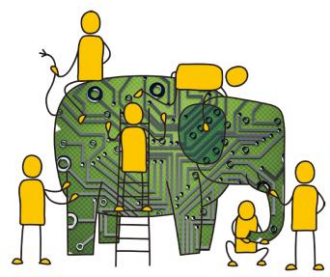


By Matt McFarland, CNN Business

Updated 1830 GMT (0230 HKT) October 30, 2020



2020년 10월 30일 뉴스



디지털 데믹과 숨겨진 위험?

- 기술적인 어려움뿐 아니라 윤리적인, 법률적인 문제까지 포함

nature > news > article

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NEWS · 24 OCTOBER 2018

Self-driving car dilemmas reveal that moral choices are not universal

Survey maps global variations in ethics for programming autonomous vehicles.

Amy Maxmen


[PDF version](#)

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Autonomous vehicles

Machine ethics: The dilemma

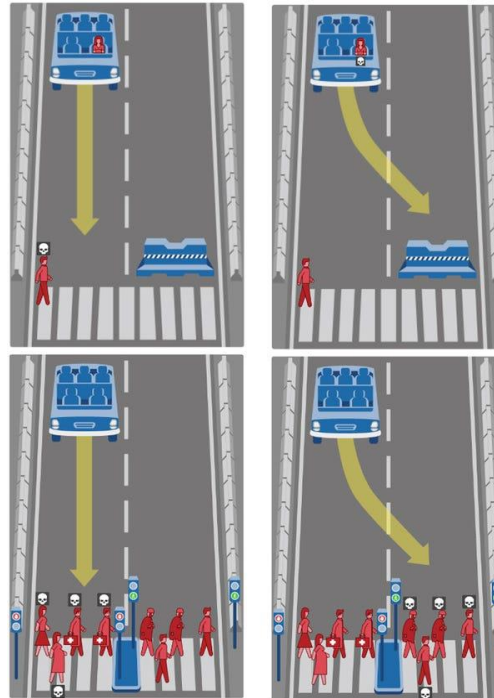
Editorial: Road test

SUBJECTS
[Computer science](#)



Self-driving cars are being developed by several major technology companies and carmakers. credit: VCG/Getty

When a driver slams on the brakes to avoid hitting a pedestrian crossing the road illegally, she is making a moral decision that shifts risk from the pedestrian to the people in the car. Self-driving cars might soon have to make such ethical judgments on their own – but settling on a universal moral code for the vehicles could be a thorny task, suggests a survey of 2.3 million people



2018년 10월 24일 뉴스

소프트웨어 재난?

- 소프트웨어의 올바른 작동에 의존적인 사회는 피할 수도, 거스를 수도 없는 추세
 - 의료장비, 전력망, 자율자동차, 드론, ... 등 사회 거의 전 분야

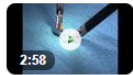
surgical robot da vinci accidents

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www.autoaccident.com > ... > Defective Medical Devices

Da Vinci Robotic Surgical System - Injuries and Deaths



Da Vinci Robotic Surgical System - Injuries and Deaths - Freezing controls: When this happens, the ...
Jan 31, 2019 · Uploaded by lucka luck

www.advisory.com > daily-briefing > 2015/07/22 > mo... ▾

More people are dying from robotic surgery—but should ...



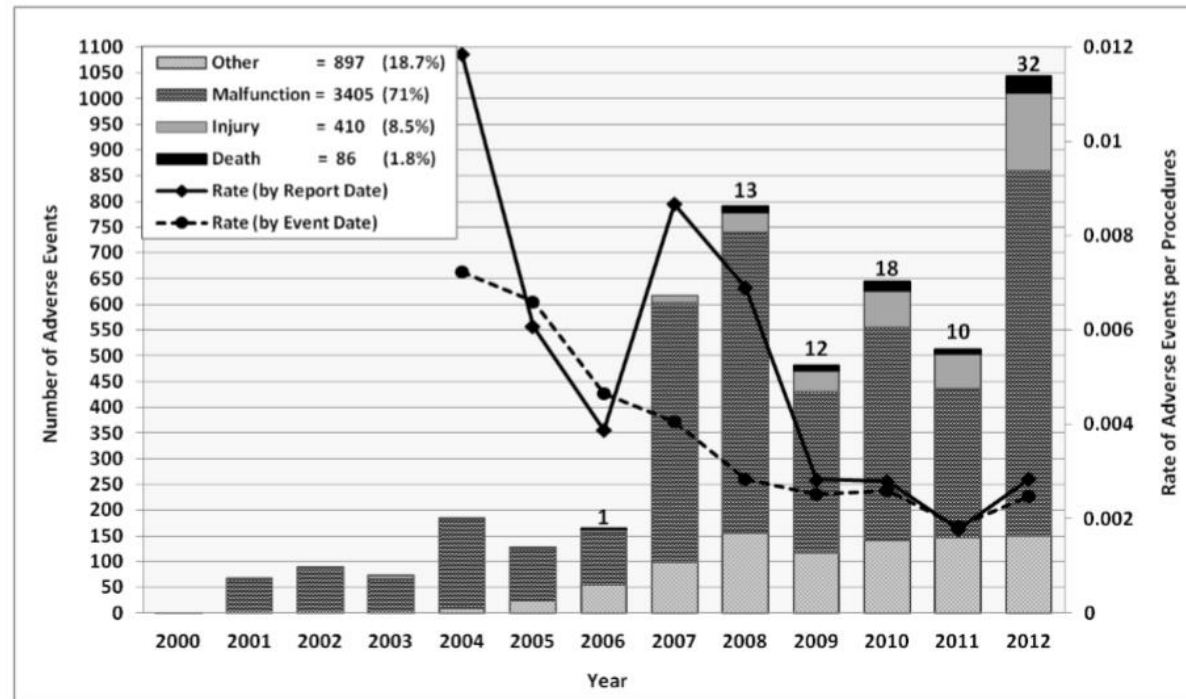
The study authors note that while the number of injuries and deaths p
Robotic surgical systems, such as ...
Jul 22, 2015

pribanic.com > Medical Malpractice

Robotic Surgery Mishaps Can Lead to Injury or Death



PROBLEMS FROM ROBOTIC SURGERY However, BBC reported the least 144 deaths and more than ...
Jun 27, 2016



FDA에 보고된 다빈치 로봇수술 시스템의 사고 사례

소프트웨어 재난 사례

- 사소해 보이는 소프트웨어 오류가 때로는 심각한 피해를 초래함
 - 예: Ariane 5 로켓 폭발

HOME / BLOG / A SPACE ERROR: 370.000.000 \$ FOR AN I...

A space error: 370.000.000 \$ for an integer overflow

Aleksey Statsenko

© Sept. 2, 2016

Articles: 6

#Cpp

Contents

- Dossier
- Technical details of the accident
- Significant phases of development process
- The causes and origins of the accident
- Conclusion
- Happy ending
- Sources

Start. 37 seconds of flight. KaBOOM! 10 years and 7 billion dollars are turning into dust.



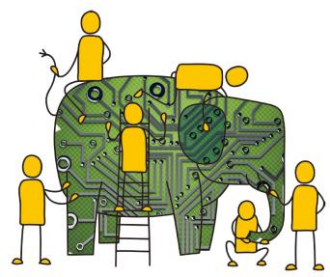
Why visibility matters—the Ariane 5 crash

- Velocity was represented as a 64-bit float
- A conversion into a 16-bit signed integer caused an overflow
- The current velocity of Ariane 5 was too high to be represented as a 16-bit integer
- Error handling was suppressed for performance reasons

```
-- Vertical velocity bias as measured by sensor
L_M_BV_32 :=
  TBD.T_ENTIER_32S ((1.0/C_M_LSB_BV) *
    G_M_INFO_DERIVE(T_ALG.E_BV));
-- Check, if measured vertical velocity bias can be
-- converted to a 16 bit int. If so, then convert
if L_M_BV_32 > 32767 then
  P_M_DERIVE(T_ALG.E_BV) := 16#7FFF#;
elsif L_M_BV_32 < -32768 then
  P_M_DERIVE(T_ALG.E_BV) := 16#8000#;
else
  P_M_DERIVE(T_ALG.E_BV) :=
    UC_16S_EN_16NS(TDB.T_ENTIER_16S(L_M_BV_32));
end if;
-- Horizontal velocity bias as measured by sensor
-- is converted to a 16 bit int without checking
P_M_DERIVE(T_ALG.E_BH) :=
  UC_16S_EN_16NS (TDB.T_ENTIER_16S ((1.0/C_M_LSB_BH) *
    G_M_INFO_DERIVE(T_ALG.E_BH)));
```

*Source: <http://moscova.inria.fr/~levy/talks/10enslongo/enslongo.pdf>

```
L_M_BV_32 := TBD.T_ENTIER_32S ((1.0/C_M_LSB_BV) *
  G_M_INFO_DERIVE(T_ALG.E_BV));
if L_M_BV_32 > 32767 then
  P_M_DERIVE(T_ALG.E_BV) := 16#7FFF#;
elsif L_M_BV_32 < -32768 then
  P_M_DERIVE(T_ALG.E_BV) := 16#8000#;
else
  P_M_DERIVE(T_ALG.E_BV) := UC_16S_EN_16NS(TDB.T_ENTIER_16S(L_M
end if;
P_M_DERIVE(T_ALG.E_BH) := UC_16S_EN_16NS (TDB.T_ENTIER_16S
  ((1.0/C_M_LSB_BH) *
    G_M_INFO_DERIVE(T_ALG.E_BH)))
end LIRE_DERIVE;
```



디지털 데믹과 소프트웨어 재난

- 모든 소프트웨어 재난이 반드시 소프트웨어의 오류로 인한 것은 아님을 기억해야 함
 - 패트리엇 미사일의 요격실패는 개발시 가정된 작동환경과 실제 작전환경의 차이로 인해 발생한 오류
- 오류가 없는 “완벽한” 소프트웨어의 개발은 불가능하고 비현실적인 기대

Search results for "patriot missile failure".

Search bar: patriot missile failure

Navigation: All, Images, Videos, News, Maps, More, Settings, Tools

Results: About 2,290,000 results (0.39 seconds)

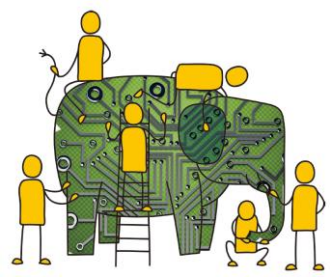
Image thumbnails showing missile launches and diagrams.

Patriot missile failure

On February 25, 1991, during the Gulf War, an American **Patriot Missile** battery in Dharan, Saudi Arabia, **failed** to track and intercept an incoming Iraqi Scud **missile**. The Scud struck an American Army barracks, killing 28 soldiers and injuring around 100 other people. Feb 25, 1991

www.ima.umn.edu > ~arnold > disasters > patriot

[The Patriot Missile Failure](#)



- 디지털 데믹으로 발생할 수 있는 소프트웨어 재난은 우리 모두의 문제
 - 누구에게나, 아무때나 발생할 수 있음
 - 피할 수도 없고, 거스를 수도 없는 시대의 흐름
 - “안전한 시스템”을 요구하는, 그리고 이에 필요한 비용을 지불하는 “
 깨어있는 소비자”
- “적절한 수준”의 안전성 확보를 법제화하는 것이 필요
- 소프트웨어 공학기술의 개발, 안전성 검증 및 평가에 필요한 “국가적인
투자” 필요
 - 안전한 사회 구축을 위한 필수 비용
- 소프트웨어 기반 안전산업의 활성화 및 국제적인 경쟁력 확보