1
00:00:06,630 --> 00:00:03,030
i'm ron diffler i'm the robonaut lead at

2
00:00:10,549 --> 00:00:08,710
robonaut is actually a series of robots

3
00:00:12,709 --> 00:00:10,559
there's both the robonaut 1 and the

4
00:00:15,829 --> 00:00:12,719
robonaut 2. robonaut 1 was originally

5
00:00:17,670 --> 00:00:15,839
developed by nasa in the late 1990s

6
00:00:19,109 --> 00:00:17,680
and robonaut 2 has been developed over

7
00:00:21,029 --> 00:00:19,119
the last few years

8
00:00:22,470 --> 00:00:21,039
by a team of both nasa and general

9
00:00:25,670 --> 00:00:22,480
motors engineers

10
00:00:28,070 --> 00:00:25,680
it is a humanoid robot designed to help

11
00:00:31,669 --> 00:00:28,080
people perform a variety of tasks that

12
00:00:33,270 --> 00:00:31,679
currently other robots cannot do

13
00:00:35,990 --> 00:00:33,280

the goal here is that there are many

14
00:00:38,150 --> 00:00:36,000
tasks that can be

15
00:00:39,990 --> 00:00:38,160
more efficiently offloaded to robots for

16
00:00:41,510 --> 00:00:40,000
example in space

17
00:00:43,830 --> 00:00:41,520
when astronauts perform tasks there's a

18
00:00:45,510 --> 00:00:43,840
lot of setup before the task is actually

19
00:00:47,190 --> 00:00:45,520
started and a lot of tear down after the

20
00:00:48,869 --> 00:00:47,200
task is done particularly on space

21
00:00:50,470 --> 00:00:48,879
station setting up the tools setting up

22
00:00:53,110 --> 00:00:50,480
a variety of equipment

23
00:00:54,950 --> 00:00:53,120
if a robot can perform that task it

24
00:00:56,310 --> 00:00:54,960
allows the crew person to be much more

25
00:00:59,670 --> 00:00:56,320
efficient doing the things that only a

26
00:01:02,229 --> 00:00:59,680
crew person can do

27
00:01:05,109 --> 00:01:02,239
starting with r1 we went after

28
00:01:07,270 --> 00:01:05,119
both the hands and arms they give you a

29
00:01:08,789 --> 00:01:07,280
workspace and a dexterity that's very

30
00:01:10,870 --> 00:01:08,799
similar to a human

31
00:01:13,590 --> 00:01:10,880
we went to r2 we increased that we

32
00:01:15,670 --> 00:01:13,600
increased the speed at which we could

33
00:01:17,749 --> 00:01:15,680
perform tasks and we increased the level

34
00:01:21,510 --> 00:01:17,759
of dexterity so that we can even perform

35
00:01:23,830 --> 00:01:21,520
more tasks than the original r1 can

36
00:01:26,630 --> 00:01:23,840
general motors was looking just like us

37
00:01:28,950 --> 00:01:26,640
for more options when it comes to mixing

38
00:01:31,030 --> 00:01:28,960

robotic technology and the human

39
00:01:33,510 --> 00:01:31,040
workforce how can they be more efficient

40
00:01:35,910 --> 00:01:33,520
the more options you have both in space

41
00:01:38,550 --> 00:01:35,920
and in plant and in an assembly plant

42
00:01:40,710 --> 00:01:38,560
the better the opportunity is to become

43
00:01:43,510 --> 00:01:40,720
more efficient

44
00:01:44,230 --> 00:01:43,520
both organizations are looking for ways

45
00:01:49,590 --> 00:01:44,240
to

46
00:01:52,149 --> 00:01:49,600
so that both space missions and assembly

47
00:01:55,350 --> 00:01:52,159
plants can be

48
00:01:57,350 --> 00:01:55,360
more efficient

49
00:01:59,749 --> 00:01:57,360
partnership between nasa and gm has been

50
00:02:01,350 --> 00:01:59,759
a fantastic one and it has resulted in

51
00:02:03,429 --> 00:02:01,360
benefits that we hadn't predicted when

52
00:02:05,910 --> 00:02:03,439
we first started together

53
00:02:07,510 --> 00:02:05,920
both sides are looking for as dexterous

54
00:02:08,550 --> 00:02:07,520
and as efficient a robotic system as

55
00:02:10,309 --> 00:02:08,560
possible

56
00:02:12,070 --> 00:02:10,319
but what's also been amazing is the

57
00:02:14,070 --> 00:02:12,080
application overlap between the two

58
00:02:17,110 --> 00:02:14,080
groups many things that we have to do in

59
00:02:18,550 --> 00:02:17,120
space that humans have to do are in many

60
00:02:21,350 --> 00:02:18,560
ways similar to

61
00:02:23,350 --> 00:02:21,360
the complexity the the situation when

62
00:02:23,990 --> 00:02:23,360
you're building a car both

63
00:02:26,150 --> 00:02:24,000

are

64
00:02:27,670 --> 00:02:26,160
complex activities and we have found

65
00:02:30,790 --> 00:02:27,680
interesting overlap that's been into the

66
00:02:34,949 --> 00:02:33,030
my name is marty lin i'm the principal

67
00:02:37,509 --> 00:02:34,959
engineer of robotics for the general

68
00:02:39,750 --> 00:02:37,519
motors company

69
00:02:42,150 --> 00:02:39,760
general motors and nasa have a long

70
00:02:44,390 --> 00:02:42,160
history of working together going back

71
00:02:45,509 --> 00:02:44,400
to the original lunar rover

72
00:02:47,670 --> 00:02:45,519
and

73
00:02:50,470 --> 00:02:47,680
it would seem like a natural fit for the

74
00:02:52,790 --> 00:02:50,480
general motors corporation and nasa to

75
00:02:57,190 --> 00:02:52,800
work together on the development of the

76
00:03:02,149 --> 00:02:59,990
the current robonaut was developed

77
00:03:04,470 --> 00:03:02,159
really as a result of a partnership

78
00:03:06,710 --> 00:03:04,480
between the nasa johnson space center

79
00:03:09,270 --> 00:03:06,720
and general motors so general motors

80
00:03:11,830 --> 00:03:09,280
sent down a team of engineers

81
00:03:15,110 --> 00:03:11,840
to work side by side with the nasa

82
00:03:17,589 --> 00:03:15,120
engineers developing and assembling

83
00:03:21,910 --> 00:03:17,599
designing and building the

84
00:03:26,789 --> 00:03:24,229
from general motors perspective we want

85
00:03:30,149 --> 00:03:26,799
to be able to automate tasks that are

86
00:03:33,030 --> 00:03:30,159
very repetitious dull or ergonomically

87
00:03:35,589 --> 00:03:33,040
challenging for our operators and those

88
00:03:37,750 --> 00:03:35,599

requirements are very similar to some of

89
00:03:39,750 --> 00:03:37,760
the tasks that nasa would like to be

90
00:03:42,869 --> 00:03:39,760
able to automate to help

91
00:03:45,270 --> 00:03:42,879
and astronauts so from that perspective

92
00:03:48,309 --> 00:03:45,280
we're looking at using robots and

93
00:03:50,869 --> 00:03:48,319
automation to support our operators to

94
00:03:53,830 --> 00:03:50,879
support our people doing the work doing

95
00:03:57,910 --> 00:03:53,840
the things that are not as value added

96
00:04:02,949 --> 00:04:01,270
we see the the technologies and the

97
00:04:05,110 --> 00:04:02,959
things that are developed that make up

98
00:04:07,910 --> 00:04:05,120
robonaut being used in our assembly

99
00:04:10,710 --> 00:04:07,920
plants very shortly

100
00:04:13,350 --> 00:04:10,720
we see great benefit to the sensing to

101
00:04:16,469 --> 00:04:13,360
the types of controls to the to the

102
00:04:18,550 --> 00:04:16,479
software that's used in robonaut we see

103
00:04:20,150 --> 00:04:18,560
that as being beneficial and and we'll

104
00:04:22,550 --> 00:04:20,160
be using that very shortly in our

105
00:04:25,110 --> 00:04:22,560
assembly plans

106
00:04:27,590 --> 00:04:25,120
the nasa johnson space center was really

107
00:04:30,629 --> 00:04:27,600
one of the world leaders in developing

108
00:04:34,390 --> 00:04:30,639
robots of this of this class

109
00:04:35,749 --> 00:04:34,400
it was a natural evolution for us to and

110
00:04:37,670 --> 00:04:35,759
the synergies between the two

111
00:04:39,670 --> 00:04:37,680
organizations was really great the

112
00:04:40,830 --> 00:04:39,680
natural evolution for us to be able to

113
00:04:43,990 --> 00:04:40,840

get together

114
00:04:45,270 --> 00:04:44,000
and be able to work on the

115
00:04:49,110 --> 00:04:45,280
latest

116
00:04:54,790 --> 00:04:51,830
general motors and nasa began working on

117
00:04:57,110 --> 00:04:54,800
the current robonaut r2 about three

118
00:04:59,030 --> 00:04:57,120
years ago the relationship has been

119
00:05:01,510 --> 00:04:59,040
fantastic the partnership's been

120
00:05:03,830 --> 00:05:01,520
fantastic and as you see from the robot

121
00:05:06,870 --> 00:05:03,840
the robot's pretty um pretty amazing

122
00:05:09,430 --> 00:05:06,880
device it really we have hit all of the

123
00:05:11,510 --> 00:05:09,440
objectives that we wanted it

124
00:05:14,310 --> 00:05:11,520
that we set out to hit when we started

125
00:05:18,710 --> 00:05:16,150
the partnership has been absolutely

126
00:05:21,350 --> 00:05:18,720
fantastic we've been able to develop the

127
00:05:23,270 --> 00:05:21,360
technologies that we believe are really

128
00:05:25,430 --> 00:05:23,280
going to help with the competitiveness

129
00:05:28,230 --> 00:05:25,440
of the general motors company as well as

130
00:05:31,590 --> 00:05:28,240
the competitiveness of the country

131
00:05:34,629 --> 00:05:31,600
robotics are really the future of

132
00:05:39,830 --> 00:05:34,639
of our ability as a country to be able

133
00:05:43,830 --> 00:05:41,909
one of gm's core goals is to lead in

134
00:05:46,390 --> 00:05:43,840
advanced technology and quality in

135
00:05:48,469 --> 00:05:46,400
creating the world's best vehicles

136
00:05:50,230 --> 00:05:48,479
the partnership with nasa and the

137
00:05:52,070 --> 00:05:50,240
development of r2 provide those

138
00:05:54,070 --> 00:05:52,080

innovative technologies that will help

139
00:05:57,430 --> 00:05:54,080
us achieve those goals in both our

140
00:05:59,270 --> 00:05:57,440
plants and our products

141
00:06:01,270 --> 00:05:59,280
for general motors it's all about safer

142
00:06:03,670 --> 00:06:01,280
vehicles and safer plants the

143
00:06:05,590 --> 00:06:03,680
technologies being developed in r2 will

144
00:06:07,749 --> 00:06:05,600
help our engineers develop advanced

145
00:06:31,510 --> 00:06:07,759
vehicle safety systems that will be used

146
00:06:31,520 --> 00:06:41,909
food

147
00:06:41,919 --> 00:07:07,189
yes